635.05
How

Rec'd
18.12.1911
Hemmulage
GOVT. BOTANIC GARDEN
LAL BAGH, BANGALORE
GOVERNMENT BOTANICAL GARDENS
LIBRARY.
Section.....
No.....

FOURTH ANNUAL REPORT

OF THE

Missouri State Board of Horticulture

1910

Containing the Proceedings of the Neosho Strawberry Congress, Parkville Horticultural Institute, St. Joseph Horticultural Institute, Fifty-third Annual Meeting of the State Horticultural Society, Held at Columbia, January 10-13, 1911, and the Fifty-first Annual Meeting of the State Horticultural Society, Held at Springfield, Dec., 1908.

W. L. HOWARD, *Secretary*

THE HUGH STEPHENS PRINTING COMPANY,
JEFFERSON CITY, MO.

635.06
Hnw

Missouri State Board of Horticulture.

(Created by Act of the Legislature, March 12, 1907.)

OFFICERS OF THE BOARD FROM DECEMBER, 1910, UNTIL JUNE, 1911.

R. M. HITT, President.....Koshkonong
T. C. WILSON, 1st Vice-President.....Columbia
D. A. TURNER, Sr., 2nd Vice-President.....St. Joseph
W. T. FLOURNOY, Treasurer.....Marionville
W. L. HOWARD, Secretary (term expires June, 1912).....Columbia

CORPORATE MEMBERS OF THE BOARD.

FIRST DISTRICT, W. P. STARK.....Louisiana
(Term expires June, 1911.)

SECOND DISTRICT, D. A. TURNER, Sr.....St. Joseph
(Term expires June, 1913.)

THIRD DISTRICT, C. H. DUTCHER.....Warrensburg
(Term expires June, 1911.)

FOURTH DISTRICT, T. C. WILSON.....Columbia
(Term expires June, 1913.)

FIFTH DISTRICT, R. M. HITT.....Koshkonong
(Term expires June, 1911.)

SIXTH DISTRICT, W. T. FLOURNOY.....Marionville
(Term expires June, 1913.)

EX-OFFICIO MEMBERS.

HON. HERBERT S. HADLEY.....Governor of Missouri
DR. J. C. WHITTEN.....Professor of Horticulture, University of Missouri
HON. W. P. EVANS.....State Superintendent of Schools

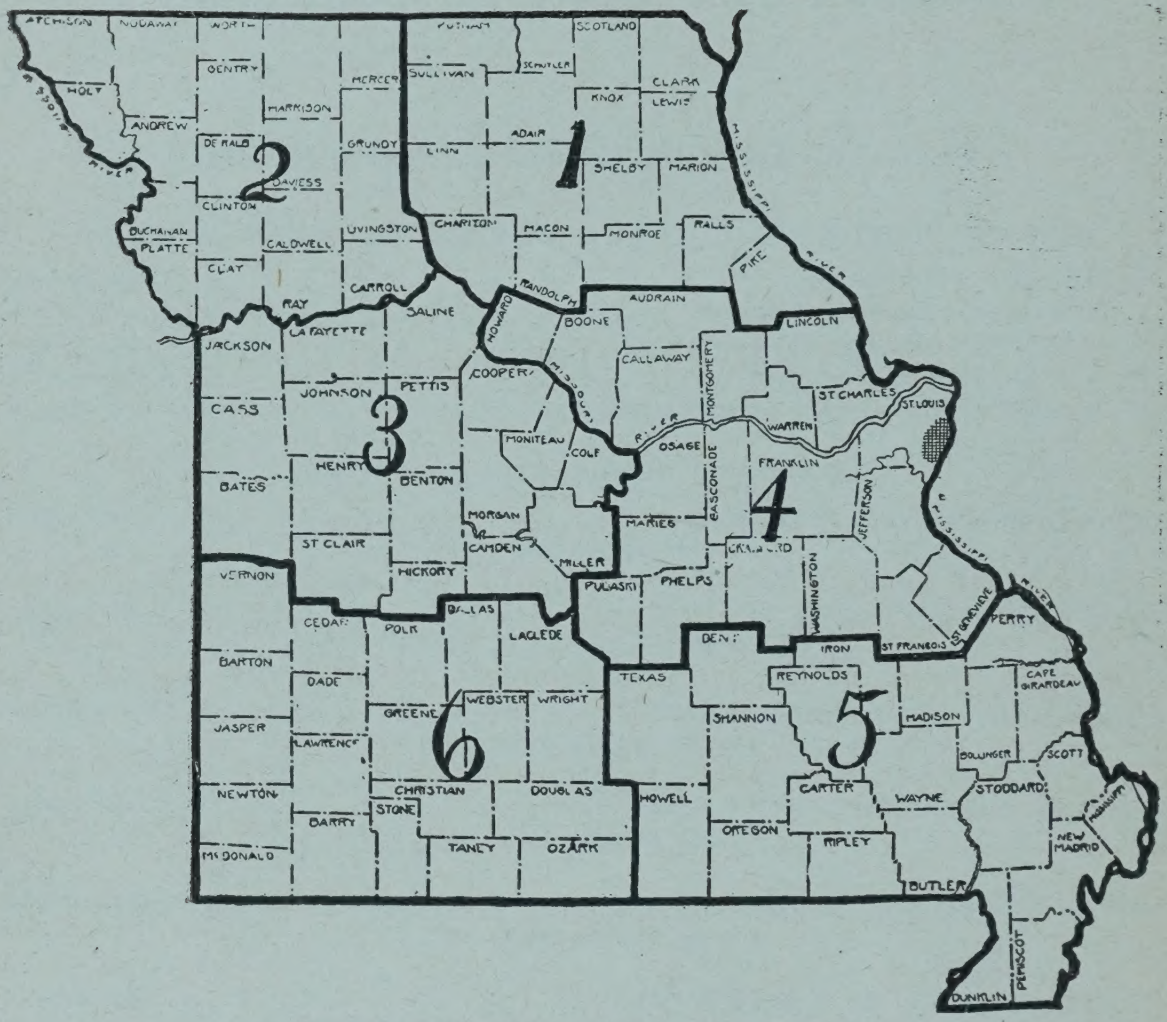


FIG. 1. HORTICULTURAL DISTRICTS.

Map showing the counties embraced in each of the six Horticultural Districts of Missouri. The Governor appoints a man from each district for a term of four years. See previous page for names and addresses of Board members as they stood during the year 1910.

LETTER OF TRANSMITTAL.

To Hon. Herbert S. Hadley, Governor of Missouri:

Sir—In compliance with section 613, Revised Statutes of Missouri for 1909, I have the honor to transmit herewith a report of the work of the State Board of Horticulture, financial and otherwise, for the year 1910.

Very respectfully,

W. L. HOWARD, Secretary.

GOVERNMENT BOTANICAL GARDENS
LIBRARY.
Section.....
No. .....

CONTENTS.

(For Index see back of Book.)

Page

Secretary's Report for the Year, 1910 9
Secretary's Financial Report 20
Report of Treasurer 29
Neosho Strawberry Congress 31
Address of Welcome 31
Response to Welcome Address 31
Trials and Difficulties of a Manager of a Berry Association 32
Overproduction of Strawberries 40
The Cause of High Prices of Berries During the Season of 1910, and can we Expect them to Continue in the Future 44
How to Secure a big Yield of Strawberries 46
Experience in Smudging Strawberries 47
Nursery and Orchard Inspection 52
Spraying Strawberries for Rust 53
Shed Packing of Strawberries 55
Inspection of Strawberries 58
Parkville Horticultural Institute 61
The Commerical Apple Orchard 61
Growing Market Grapes 64
Brief Review of all-the-year-round Management of the Apple Orchard 67
The Future of Missouri Fruit Growing 68
Nursery and Orchard Inspection 71
St. Joseph Horticultural Institute 72
Address of Welcome 72
Response by R. M. Hitt 73
Sod *versus* Cultivation for the Orchard 74
The 1910 Apple Crop 76
Selecting the Trees and Planting an Apple Orchard 79
Marketing the Apple Crop 81
Missouri Cherry Growing 85
Planting and Management of Cheery Trees 87
Peaches and Peach Growing in Northwestern Missouri 90
Inspection of Nurseries and Orchards 91
Western Methods Applied to Missouri Conditions 92
Peaches and Peach Growing in Northwestern Missouri 96
Some new House Plants 97
Learning the Fruit Growing Business 100
Does it Pay to Spray 107
Plums and How to Grow Them 108
The Latest Methods of Spraying Apple Trees 110
Common Sense Applied to Fruit Growing 112
Premiums Awarded at St. Joseph 114
Summer Apples 115
Fifty-third Annual Meeting of the Missouri State Horticultural Society at Columbia 119
Are the Springs Colder Now 119
Some Physiological Factors in Strawberry Growing 133
The Influence of Environmental Conditions Upon the Development of Plant Diseases 138
Co-Operation 155
Orchard Heating 159
Inspection Bill Endorsed 164
Remarks From Delegates and Visitors From Other States 165
In Memoriam—Wm. Groves Gano, Morris Butterfield, Lee's Summit, Mo., S. Walker, Liberty, Mo 166
Prices Awarded for Fruit, etc 169

Page

Miscellaneous Papers:
Hints on Pruning Apple Trees ... 172
Plant Propagation ... 177
Asparagus and Rhubarb Culture ... 217
The Time of Planting Vegetables ... 224
Growing Cucurbits ... 226
Sweet Potato Growing ... 229
The Effects of a Freak Season on Fruit Trees ... 231
Celery Growing ... 232
Celery Culture ... 234
Raspberry Culture ... 239
The Grape, Its Origin and Varieties ... 246
The Pecan ... 247
Nut Growing in the North ... 254
Fifty-first Annual Meeting of the Missouri State Horticultural Society Held at Springfield, Missouri ... 257
Horticulture in Rural Schools ... 257
Nature Study as Applied to Agriculture ... 261
Agricultural Course at State Normal ... 263
The College and Agriculture ... 264
Insect Enemies of Ornamentals ... 266
Bees and Horticulture ... 270
In the Strawberry Field ... 276
The Farm Home Strawberry Bed ... 278
Growing and Handling Peaches for the City Retail Market ... 280
Co-Operation in Marketing ... 281
Planting and Cultivating the Orchard ... 284
Marketing Peaches ... 285
Profitable Apples for North Missouri ... 286
Report of Committee on Awards ... 287
Co-Operation Among Fruit Growers ... 288
Strawberries ... 344
The Missouri State Board of Horticulture Mailing List ... 366

GOVERNMENT BOTANICAL GARDENS

SECRETARY'S REPORT FOR THE YEAR 1910.

(By W. L. Howard, Secretary State Board of Horticulture, Columbia, Mo.)

The year 1910, from the standpoint of horticulturists, was freakish throughout. The winter began with great severity for the time of year. There was much injury to plants that were not entirely hardy, and in many instances to the immature parts of those that were hardy. Insect life seems to have been as little prepared for such a weather extreme as plants, and seemingly as a result, the following season showed a scarcity of insect forms, which we are nearly always accustomed to see in comparative abundance. The mid-winter season presented no very unusual features, but toward the close there were some great extremes. The month of February was exceedingly warm, and this sort of weather continued throughout the greater part of March. Vegetation began to grow and fruits of all kinds were in bloom a full month earlier than usual. In April, cold weather commenced, and so far as the fruit grower was concerned the cold season culminated in a blizzard of great severity on April 23rd. In Central Missouri, on the morning of April 24th, there was a snow storm accompanied by a strong wind, which lasted for five or six hours. During this time the temperature fell as low as twenty-six degrees F. Owing to the advanced stage of vegetation of all kinds, including the fruits, there was wide-spread damage.

One very eccentric feature of the cold spell was that, although the storm came from the northwest, the northwestern part of Missouri was perhaps the least injured of any other section. A portion of the southwestern part of the State, as well as a district in the south central section, suffered only in a comparatively slight degree. In most places, where there was fruit at all, the best was to be found in the low places. Many people did not understand this, as it is usually expected that the low places will suffer most. The explanation is that the storm swept over the country at a high rate of speed, and the freezing air was carried over the low places, leaving the lower and warmer layers of the atmosphere undisturbed. In time of frosts, and even during the freezes of cloudy weather in spring, where the cold air settles straight downward or

flows into the low places, the damage is always greatest in the low areas, but during the storm of April, 1910, conditions were wholly different.

Early in May there was another period of cold weather, but there was no serious damage done.

The growing season was exceedingly favorable to the best development of such fruits as survived the spring freeze. Insects were scarce, and diseases of apples, at least, were conspicuous by their absence. The weather conditions being favorable to a humid atmosphere just before and during peach harvesting time, the growers of this fruit had to fight to save their crops from the rot.

SEASONAL CHANGES.

In view of the fact that Missouri and adjacent states in the Mississippi valley suffered very much from late spring frosts and freezes for three or four consecutive seasons, Mr. George Reeder, who is in charge of the U. S. Weather Bureau at Columbia, was asked to make a study of the records to find if the seasons were really changing, that is, were becoming colder in spring. Mr. Reeder's paper, entitled "Are the Springs Colder Now," is reproduced in full elsewhere in this Report. Briefly, Mr. Reeder's findings showed that for a thirty-year period the seasons seemed to have been moving in ten-year cycles. Taking the latest date at which there was a freezing temperature, as a basis, it is found that the dates on which these freezes occurred, fluctuated year by year until the date of last killing frost was as far back as April first. Then there were many fluctuations during the next ten years, culminating by a freeze on May 6th. Following this, the other extreme was reached five years later, when the last freeze was on April 5th. Beginning with this date, April 5, 1896, the dates on which the last freeze occurred, go up and down, up and down, but constantly on the advance, until ten years later, 1906, when the last frost occurred on May 7th. In 1907, the frost date was May 5th. In 1908, May 2nd; in 1909, May 2nd; in 1910, April 25th, and in 1911, April 9th.

These facts seem to indicate that we are now in a cycle when the frost line is retreating back toward the early days in April, and that we may reasonably hope to be free from killing frosts for a few years at least. The anxious fruit grower asks if this period will last only ten years, or whether it will be longer. Unfortunately, no one can say with any degree of certainty how much longer we shall be protected, but if we may be permitted to judge the future by the past, we can certainly hope to enjoy immunity from this great danger for from three to five years more.

FRUIT CROP OF 1910.

The freeze of April 23rd and 24th caused such wide-spread injury throughout the State that the crop as a whole was very short. The district which produced apples was limited to about one-sixth of the State, mostly confined to the western counties from Iowa to Arkansas. There were a few small districts outside of this region, which produced apples. No figures are at hand to indicate just how many apples were produced as measured by barrels or cars, but it is known that in a district limited to about fifty miles, north, east and south of St. Joseph, over six hundred cars of apples were shipped out. The counties of Platte and Holt, combined, probably shipped another six hundred cars.

In Southwestern Missouri, Greene, Lawrence and McDonald counties marketed some heavy shipments.

Despite the cold weather of winter, and the freezes in the spring, the peaches in the south central counties were not frozen out. In the Koshkonong-Brandsville district, where the largest orchards are located, the yield of peaches was very heavy. Incidentally, it might be said that those who sprayed their peach trees with the unboiled lime-sulphur and arsenate of lead, definitely proved that the much dreaded brown rot can be controlled. One large grower, as a result of spraying, marketed ninety-five per cent of a full crop of peaches, while his near neighbor did not spray and marketed only five per cent of his peach crop.

While only a small per cent of the State produced peaches, the fact that certain small sections in the southern part of Missouri, where there are large orchards, had practically a full crop, the State was enabled to ship more of this fruit than it sometimes does when there is a crop reported from a majority of the counties.

Strawberries did not produce as heavily as in some years, but the crop was the most profitable to the growers that has ever been harvested. Nearly every field in the famous district of Southwestern Missouri produced a light yield, but owing to the cool weather which prevailed in early June, the fruit ripened slowly and every bit of it was saved. Frequently there are heavy rains at ripening time, which spoil a goodly percentage of the berries. This was not true during the past season. Prices were very good; in fact, first-class, and the season as a whole may be said to have been a very prosperous one.

SPECIAL FRUIT DISTRICTS.

We are gradually finding out where the best fruits of the different kinds can be grown with the greatest safety. Apples require a special soil, which must be of a porous nature down to a considerable depth in

order to produce healthy trees, which will be productive. We are finding that there are some locations where apple orchards must be given careful attention in late summer to prevent the dry weather from cutting short the crop of fruit buds, which will form the next season's crop of fruit. In such places the moisture must be carefully conserved during the month of August by frequent tillage or a system of cover cropping, which will answer the same purposes. Also, we are finding out that certain varieties, as for instance, the Ingram, have a habit of blooming very late, and hence nearly always escape injury from spring frosts. We are further learning how to make certain orchards, often old ones, which are unproductive because the varieties are not adapted to the region, bear, by top working the trees to desirable varieties. By carefully watching the behavior of trees long planted in various sections, we are acquiring information as to the districts which seem unadapted to apple growing. Sometimes the region may appear to have the right requirements as regard soil, but still seems to suffer injury from the cold of winter or frosts of early spring. We now have considerable information as to the sections that are unadapted to fruit growing on account of various reasons.

Gradually special fruit districts are being proven, for example, the record of the Koshkonong-Brandsville district in Oregon and Howell counties has demonstrated that the peach there is peculiarly at home. As far as natural conditions are concerned, there is probably not a more favored district than this for peach growing in Missouri, or any other state. Even there, however, the growers have learned to not plant their peaches in low places. They also know that it is necessary to cultivate, spray and prune. By doing these things, and once in a long while using orchard heaters, there will probably never be an entire failure of this crop.

Some of the southwestern counties, particularly McDonald, Newton, Jasper, Lawrence, Barry and Greene, have been shown to be highly favorable to growing the best quality of strawberries. The strawberry industry is now highly organized in these southwestern counties, and large crops can be handled with great ease. There are organizations for growing and packing purposes, and other organizations for selling the crop. Each year new markets have to be found to consume the ever increasing output, but all problems have been successfully met by the very efficient associations.

INSTITUTES.

The first institute of the year was held at Columbia, January 28, 29 and 30, which was included in the exercises of Farmers' Week. This

institute was called the Fifty-second Annual Meeting of the Missouri State Horticultural Society. A full program was carried out and a good fruit show was held. The fruit display was particularly good in view of the short fruit crop. Liberal prizes were offered, and some very excellent apples, as well as other things, were on display.

The second institute of the year was held at Neosho, on November 15th, and was called a Strawberry Congress. This was a new departure and proved to be very popular. An extensive program was rendered, all of the papers and talks having to do with the business of growing, packing and marketing of strawberries. It is to be hoped that the Strawberry Congress will be an annual affair for the southwest.

The third institute was held at Parkville on November 16th. In the main, this was an apple growers' meeting, although a few other topics were dicussed.

On December 9-10, a two days' institute was held at St. Joseph. By co-operating with local interests, we were enabled to not only render a very splendid program, but to hold a good fruit show.

The three special institutes held out in the State took the place of the regular summer institute, which was abandoned. The experiment is regarded as being highly successful, and in future the Board hopes to increase its efficiency by holding meetings in certain places where the proceedings can be largely devoted to a special industry.

In addition to the fruit shows held in connection with the regular institutes at Neosho, Parkville, St. Joseph and Columbia, the Board of Horticulture made two special fruit displays. One of these was at the Land Congress held at Springfield in the fall, and the other was in connection with the Land and Industrial Congress held in St. Louis for one week beginning December 15th. At the latter place the Board had a large display, which had been carefully collected throughout the season for that purpose. None of these displays were made for prizes but merely to advertise the horticultural resources of the State.

OFFICE WORK.

The calls for advice on the part of fruit growers are constantly on the increase. Fortunately, by having special articles from the Annual Report re-printed in bulletin form, it has been possible to answer all inquiries in great detail. Our literature has been in great demand. It was our original intention to advertise each of our bulletins by sending notices about them to the county newspapers. This was done in the case of the first three. There was a heavy demand for No. 1 and No. 2, and when No. 3, entitled "Strawberries," was advertised, the office was

flooded with applications. These calls came from every state in the union, and from several foreign countries, including England, Holland, Belgium, France and Italy.

It has not been possible to answer all letters, but this was always done unless we had literature to send, which covered the inquiries. Our postage bill for the twelve months amounted to nearly $1,200.00. Something over one-half of this was expended in mailing out the Annual Report, while the remainder was spent in sending out bulletins and in letter writing. This will give some idea of the business which has been transacted in the office during the year. From time to time, circular letters were sent out to long lists of fruit growers, or to all of the names appearing upon our regular mailing list. We are to-day in closer touch with the people of the State than ever before.

ORCHARD CENSUS.

A year ago mention was made of an effort we were making to find out the number of orchards in the State, but the work had to be temporarily abandoned on account of pressure of other duties, and lack of facilities in the office. During the coming summer, it is believed that we will have the facilities to again take up this investigation, and carry it through to completion. It will be a gigantic task to get the names of every fruit grower in every county, together with a detailed record of his trees or other fruits. However, since we can never hope to have any reliable statistics on the fruit industry until this is done, we expect to institute this work and carry it out as soon as possible.

ASSOCIATIONS ORGANIZED.

The Board has had a few applications for assistance in organizing associations. Fruit growers in every county should be organized for the purpose of growing and packing the fruit. This is particularly necessary for those who grow strawberries. We believe it will be a good plan for all of these small associations to market their fruit through one large central association, but where this does not seem feasible, the smaller local organizations might render great assistance in this respect. The Board of Horticulture welcomes requests of this kind, and a man will be sent to help effect an organization, if possible. Every fruit grower is advised to write to the Director of the Experiment Station, Columbia, Mo., and ask for a copy of Bulletin No. 97, entitled "Co-operation Among Fruit Growers." This bulletin was written by Prof. W. H. Chandler, who has made an exhaustive study of the subject of organization among fruit growers.

DELEGATES.

During the year delegates were sent to various meetings in Missouri, and in other states. This is a very desirable way in which to keep in touch with the best methods and ideas along all lines of the fruit business. In addition to sending out delegates to bring back information, we brought in visitors from other places to attend our own meetings. In this way additional information and many new ideas were secured.

ANNUAL REPORT.

The Annual Report was very late in making its appearance, owing to a delay in the publisher's office. Since many of the papers contained in the report had been written with the special object of having them appear in pamphlet form besides being printed in the reports, we were able to publish twenty-three separate bulletins. For the most part each of these consists of an edition of two thousand copies. For the first time we have begun a numbered series of bulletins. Each year it is planned to add to this list, and in addition, it is hoped that we may be able to secure an appropriation for publishing bulletins on timely subjects without their having to appear in the Annual Report. Often it is desirable to print the proceedings of a meeting immediately, and at other times great haste may be necessary in getting certain information into the hands of the fruit growers, but these things cannot be done without a special fund for this purpose. The list of bulletins published, with the number of copies of each, is as follows:

No. 1.	Home Manufacture of Cider Vinegar	7,000 copies
No. 2.	Spraying for the Control of Peach Brown Rot and Scab	6,000 copies
No. 3.	Strawberries	3,000 copies
No. 4.	Picking, Packing and Marketing of Fruit, Including Cold Storage and Evaporation	2,000 copies
No. 5.	Growing and Marketing Summer Apples. Horticulture and Honey Bees	2,000 copies
No. 6.	Landscape Gardening	3,000 copies
No. 7.	Practical School Gardening	3,000 copies
No. 8.	The small Fruits' Garden. Our Acid Small Fruits	2,000 copies
No. 9.	Manufacture, Preservation and Uses of Unfermented Grape Juice.	2,000 copies
No. 10.	Lawn Making	2,000 copies
No. 11.	Growing Early Tomatoes. Blackberries	2,000 copies
No. 12.	Marketing Fruits	2,000 copies
No. 13.	Irish Potato Growing	2,000 copies
No. 14.	Poisonous and Medical Plants of Missouri	3,000 copies
No. 15.	Pruning Peach Trees, with Notes on their General Care	2,000 copies
No. 16.	What to do for the Curculio	2,000 copies
No. 17.	The Twelve Most Popular Varieties of Missouri Apples	2,000 copies
No. 18.	Civic Improvement for Town and Country	2,000 copies
No. 19.	Carload Precooling of Fruits and Vegetables	2,000 copies
No. 20.	Adaptability of the Ingram Apple to the Soils of the Ozarks	2,000 copies
No. 21.	Cherry Growing	2,000 copies
No. 22.	Combating Diseases and Insects of the Orchard	3,000 copies
No. 23.	Missouri Fruit Growers	1,000 copies

INSPECTION OF NURSERIES.

During the past year all of the principal nurseries of the State were inspected by Dr. Leonard Haseman, head of the Department of Entomology in the University of Missouri. Upon request, Dr. Haseman furnishes the following report:

MISSOURI NURSERIES INSPECTED 1910.

For the benefit of fruit growers of the State of Missouri herewith is submitted the list of nurseries, plant establishments and green houses of Missouri which have been inspected this year, and which were apparently free from dangerous insect pests and fungus diseases. The majority of these nurseries were inspected during the regular inspecting season, July and August, 1910, though a few of them were not inspected until later in the fall and during the winter. Despite the fact that there is a very great amount of the San Jose scale and other severe insect pests and plant diseases at present in the orchards of the State, the nurseries have been and now are in very good condition. It is only seldom that inspectors have found it necessary to hold up nurseries because of these dangerous pests.

(Signed) LEONARD HASEMAN,

University of Missouri, Instructor in Entomology and entomologist of the Experiment Station.

The following hold certificates of inspection:

Aud Nursery—W. H. Johns, Aud, Mo.
Barry County Nursery—Care J. E. Lowder, Cassville, Mo.
Bloomfield Nursery—Sparkman Bros., Bloomfield, Mo.
Boonville Nursery—Peyton & Barnes, Boonville, Mo.
R. S. Brown & Son—1317 Wabash Ave., Kansas City, Mo.
Central Missouri Nursery—E. Habegger, Marion, Mo.
Clifton Hill Nursery—Clifton Hill, Mo.
Creve Coeur Nursery—William Moeller, Creve Coeur, Mo.
Ellisville Nurseries—Anthony Wilmas, Chesterfield, Mo.
Fairview Nursery—Miles Estep, Bethany, Mo.
Frost Nursery—Blue Springs, Mo.
Gibson's Ozark Nursery—S. M. Gibson, Springfield, Mo.
Howell County Nursery—G. L. Sessen, West Plains, Mo.
Jackson County Nursery—J. H. Graves, Lee's Summit, Mo.
H. W. Jenkins Nursery—Boonville, Mo.
D. McNallie Plant & Fruit Co., Sarcoxie, Mo.
Kelsey Nurseries—C. G. Ferguson, St. Joseph, Mo.
Ed Kemper & Co. Grape Nurseries—Hermann, Mo.
Lee's Summit Star Nursery—J. S. Butterfield, Lee's Summit, Mo.
Litson Nursery—Nevada, Mo.
W. W. Lowther Nursery—Joplin, Mo.
McAnelly Nursery—John McAnelly, Mendota, Mo.
Morrison Nursery—J. A. Thuli & Sons, Chamois, Mo.
Murray Nurseries—G. R. Murray, Oregon, Mo.
New Haven Nurseries—J. Bagby & Sons Co., New Haven, Mo.
Arthur L. Norton Nursery—Clarksville, Mo.
J. B. Oliver—Sarcoxie, Mo.
Old Reliable Nursery Co.—2100 E. 14th St., Kansas City, Mo.
Ononogo Fruit Gardens—B. C. Auten, Carthage, Mo.
Ozark Plant and Fruit Farm—Seligman, Mo.
Roach Brothers—Monett, Mo.
W. L. Roch—1116 Walnut St., Kansas City, Mo.
Roeder Nursery—W. H. Roeder, Osceola, Mo.
Salisbury Nursery Co.—J. M. McCart, Salisbury, Mo.
Sanders Nursery—623 Clara Ave., St. Louis, Mo.
Henry Schnell Nursery—Glasgow, Mo.
Seligman Plant Co.—H. M. Murray, Seligman, Mo.
L. H. Smith Nursery, St. Joseph, Mo.
South St. Louis Nurseries—J. W. Schuette & Co., 5600 Gravois Ave., St. Louis, Mo.
Stanley Nursery—Campbell, Mo.
Stark Bros. Nurseries and Orchards Co., Louisiana, Mo.
Taos Nursery—Henry Rothove, Taos, Mo.

J. B. Tate, Sarcoxie, Mo.
Teas Nursery—Joplin, Mo.
H. J. Weber and Sons Nursery Co.—Nursery, Mo.
Western Nursery—W. H. Ghormly, Greenwood, Mo.
Frank Wild Floral Co., Sarcoxie, Mo.
Gilbert H. Wild, Sarcoxie, Mo.
Wild Bros. Nursery Co., Sarcoxie, Mo.
A. Waldbart and Sons—Hamilton Ave. and Horton Place, St. Louis, Mo.
Young and Sons—1406 Olive St., St. Louis, Mo.

NECESSITY FOR INSPECTION.

While this work of inspection was very conscientiously and thoroughly done, the fact remains that Missouri is in great need of a law, which will compel every person, who sells nursery stock of any kind, to hold a certificate of inspection. It is also necessary that orchards be inspected, too, and proper steps taken, if found to be a menace to the community or State.

The Board, at its business meeting, held in St. Louis in June, adopted the following resolution:

The President of the Board was authorized to appoint a committee representing the Board, he himself to be a member of said committee, to co-operate with similar committees from the experiment stations, the nurserymen's organizations and fruit growers' associations, for the purpose of uniting upon a bill to be prepared and presented to the next Legislature, which shall provide for the adequate inspection of all nurseries, orchards and plant collections of Missouri.

After sending out invitations in accordance with the above, and without meeting with much active interest, the Board prepared a bill. Copies of this proposed bill were sent to leading entomologists throughout the country and to the Chief of the Bureau of Entomology of the U. S. Department of Agriculture at Washington. Dr. L. Haseman, Entomologist of the University of Missouri, gave the Board the benefit of his advice and assistance in drawing up the measure, and, when finished, he felt that we had a good one that would fulfill every requirement. Dr. Forbes, State Entomologist of Illinois, advised with us freely, and he gave it as his opinion that we had an almost model bill. Dr. L. O. Howard, Chief of Entomology at Washington, commended the measure, and thought it was almost ideal. Copies were sent to men representing the chief nursery interests of the United States, and they considered that while the bill was a strong one and very comprehensive, that it was yet fair, and they could find no fault with it.

The proposed bill, as introduced, was as follows:

An act to prevent the introduction and dissemination in Missouri of dangerously injurious insects and plant diseases and repealing inconsistent acts named therein, and appropriating funds for carrying out the provisions of this act.

Be it enacted by the General Assembly of the State of Missouri, as follows:

Section 1. It shall be the duty of the state horticultural inspector of Missouri to inspect, or cause to be inspected, by his duly appointed assistant, at least once each

year, between July 1st and October 1st, all nurseries and nursery premises known to him in the state of Missouri, for the purpose of detecting dangerous insects and plant diseases. If upon the inspection of any nursery as above provided it shall appear that said nursery and its premises are free from dangerous insects and plant diseases, he shall send or give to the owner of said nursery, or to the person in charge of same, a certificate of inspection, stating that said nursery and premises are apparently free from such insects and diseases. Said certificate shall be issued not later than October 1st, and shall continue in force, unless revoked for cause as hereinafter provided, until the first day of July next following the date of inspection. The provisions of this section shall not apply to plants, flowers or cuttings known as green house stock nor shall native stock collected in the United States and not grown in nurseries be required to bear certificate of inspection for shipment.

Sec. 2. If the state horticultural inspector or his assistants shall find that a portion of a nursery is infested with dangerous insects or plant diseases and other portions are tnen free from infestation or infection, or if he shall have reason to believe that a nursery on account of its proximity to infested or infected premises is liable to become so infested or infected before the next annual inspection, he may prescribe, in writing, such measures of precaution or make in writing such conditions as to the use of his certificate as may in his judgment be necessary, and certificate may be withheld until such conditions have been accepted in writing by the owner of said nursery, and the use of such certificate without taking the required measures of precaution or observing such condition shall subject the owner of said nursery to the penalties prescribed in section 11 for a violation of this act.

Sec. 3. Whenever any nurseryman or seller of trees, shrubs, vines, plants, buds or cuttings, commonly known as nursery stock, within the state of Missouri shall ship or deliver any such stock, each car, box, bale, bundle, package or piece shall bear a true copy of a valid certificate of the state horticultural inspector of Missouri or by another inspector duly approved by him, showing that the said stock has been given careful inspection and found apparently free from any dangerous insects or plant diseases. Any person who shall deliver, ship or consign for shipment nursery stock or any other property without such certificate attached, or who shall use such certificate in connection with nursery stock, every part of which has not been inspected and certified as aforesaid, or who shall alter or deface such certificate shall be liable to the penalties prescribed in section 11 for a violation of this act.

Sec. 4. The power to revoke and annul said certificate is hereby given the state horticultural inspector if he shall find that his certificate of inspection has been used in violation of any of the provisions of this law. Revocation shall be through written notice to the holder of said certificate, and shall take effect forthwith, and the use of said certificate after it has been revoked and annulled and before such revocation has been withdrawn by the state horticultural inspector shall subject the holder of said certificate to the penalties provided in section 11 for a violation of this act.

Sec. 5. Nurserymen of Missouri shall be privileged to ship, under the certificates issued to them, nursery stock grown for them elsewhere or purchased by them from other states or countries: Provided, that all such stock be received under a certificate approved by the official inspector, stating that it has been inspected where grown and found to be apparently free from dangerous insects and plant diseases. The state horticultural inspector shall send, once each year, not later than July 1st, to all nurserymen in the state known to him, a list of official inspectors of other states and foreign countries whose inspection certificates may be accepted in this state, for one year from date thereof, as equivalent to the certificate of his own.

Sec. 6. Every agent for a nursery outside of Missouri and every dealer not engaged in growing trees, shrubs, plants or vines in this state for sale, who sells or delivers such stock in this state, shall, before delivering same, file with the state horticultural inspector a statement made under oath before an officer qualified to administer oaths in the locality where he may reside, or if a non-resident of the state, in the locality where said stock is sold or delivered, that said stock has passed inspection and when received by him bore official fumigation or inspection certificate, a copy of which certificate shall be filed by him with statement for the approval of the state horticultural inspector. Upon receipt of said sworn statement and a copy of certificate the state horticultural inspector shall report to the sender his approval or disapproval

of said certificate. If disapproval, the state horticultural inspector shall cause the inspection of said nursery stock and issue a certificate for same if it is found to be free from dangerous insects and plant diseases. The delivery of such stock without a certificate of inspection issued by the state horticultural inspector or approved by him shall subject the agent, dealer or other person selling or delivering the same to the penalties prescribed in section 11 for a violation of this act.

Sec. 7. Whenever any trees, shrubs, plants or vines are shipped from place to place in Missouri or shipped into Missouri from another state, country or province, every car, box, bale, bundle, package or piece thereof shall be plainly labeled on the outside with the name of the consignor, the name of the consignee and a certificate signed by an approved state or government inspector showing that the contents have been inspected by such inspector, or by his authority since the first day of July last preceding, and that the trees, vines, shrubs and plants there present and contained therein appear free from all dangerous insects and plant diseases. Whenever any trees, shrubs, vines or plants are shipped as above without such certificate plainly affixed, the facts must be reported within twenty-four hours to the state horticultural inspector by the railway, express or steamboat company or other person or persons carrying the same, and it shall be unlawful to deliver any such property until it has been inspected by the state horticultural inspector or his assistants and by him or them certified to be free from dangerous insects and plant diseases. Any agent of any railway, steamboat or express company, or other person or persons carrying such property as aforesaid, who shall fail to give such notice as above required, shall be deemed guilty of a violation of this act. Whenever nursery stock is shipped into Missouri covered by a valid certificate signed by other approved state or government inspectors such certificates shall be held prima facie evidence of the facts therein stated, but the state horticultural inspector or his assistants upon suspicion that such stock might harbor dangerous insects, pests or plant diseases shall be authorized to inspect such stock and subject it to treatment as provided in section 8 of this act.

Sec. 8. If the state horticultural inspector shall have reason to suppose that any nursery, orchard, fruit plantation or other property or place in Missouri is infested by dangerous insects or plant diseases, he shall have power to inspect, or cause to be inspected, from time to time, such nursery, orchard, fruit plantation or other property, and for the purpose of such inspection he or his assistants are authorized during reasonable business hours, to enter into or upon any farm, orchard, nursery, garden, storehouse or other building or place, public or private, used for the growing, storage, packing or sale of trees, plants or fruits, or where any such plants may be found; and if such inspection in any of the aforesaid places shall reveal the presence of dangerous insects or plant diseases liable to spread or to be conveyed to other premises to the serious injury of the property thereon, the state horticultural inspector shall notify in writing the owner or the person in carge of such infested or infected property by mailing a notice to him, properly stamped and addressed to his usual postoffice address, and shall direct him within a time and in a manner prescribed in such notice to use such measures as shall prevent the transfer or spread of such insects or diseases to the property of others and such infested or infected property shall not be removed after the owner or person in charge of same shall have been notified in writing as aforesaid, without the written permission of the state horticultural inspector or a duly authorized assistant. If the person so notified shall refuse or neglect to treat said premises or property in the manner and within the time prescribed in said notice, he shall be subject to the penalties prescribed in section 11 for a violation of this act.

Sec. 9. For the purpose of further obtaining and disseminating information concerning the life history and habits, prevention, control or extermination of dangerous insects or plant diseases, the state horticultural inspector may conduct experiments, public spraying demonstrations and from time to time publish and distribute bulletins and circulars containing such information as may be of value to the horticultural and agricultural interests of the state.

Sec. 10. The execution and enforcement of this act shall be under the direction and control of the Missouri state board of horticulture and through the state horticultural inspector, appointed by said board, and all expenses incurred in the execution of same shall be paid by the Missouri State Board of Horticulture from funds appropriated by the State for carrying out the provisions of this act.

The State Horticultural Inspector shall have power to appoint, subject to the approval of the Missouri State Board of Horticulture, such assistants as may be necessary, fixing reasonable compensation for their labors, and their acts done in pursuance of his instructions shall have the same validity as his own. The state horticultural inspector shall make an annual report of his operations to the Missouri State Board of Horticulture, showing the Missouri nurseries inspected, the number of certificates issued, the location and ownership of the premises ordered treated by him, or his assistants, in pursuance of this act. The state horticultural inspector shall furnish the prosecuting attorney with all information of matters coming to his knowledge constituting a violation of this act.

Sec. 11. Any person who shall violate any of the provisions of this act shall be deemed guilty of a misdemeanor, and upon conviction before any court having jurisdiction shall be fined not less than twenty-five dollars and not more than two hundred dollars for each and every offense, together with all costs, and shall stand committed until the same is paid.

Sec. 12. Section 630, chapter 4 of article III, Revised Statutes of 1909, and sections 623 and 627, inclusive, of chapter 4 of article III, Revised Statutes of 1909, together with all other acts or parts of acts in conflict herewith are hereby repealed.

Sec. 13. There is hereby appropriated to the State Board of Horticulture out of any funds not otherwise appropriated the sum of ten thousand ($10,000) dollars for the carrying out of the provisions of this act.

Sec. 14. There being no adequate provision for the above control of the dangerously injurious insects and plant diseases of the agricultural and horticultural interests of the state, creates an emergency within the meaning of the Constitution; therefore, this act shall take effect and be in force from and after its passage.

INDORSEMENTS.

The above bill was endorsed by practically all of the horticultural organizations of the State, among which may be mentioned: The Missouri Valley Horticultural Society, the Missouri State Horticultural Society, St. Joseph Horticultural Society, Neosho Strawberry Congress, Ozark Fruit Growers' Association, Parkville Horticultural Institute and the Western Nurserymen's Association.

SECRETARY'S FINANCIAL REPORT.

To the President and Members of the Missouri State Board of Horticulture:

Gentlemen.—I beg leave to submit the following exhibit of the financial transactions of the Board of Horticulture in detail, for the period beginning December 31, 1909, and ending January 10, 1911. This shows there was no balance in the hands of the Treasurer at the beginning of the period, but that the sum of $207.43 remained in his keeping on January 10, 1911. This report also accounts for all warrants drawn upon the Treasurer of the Board (Nos. 96 to 146, inclusive), and the total amount of our requisitions upon the State Auditor for the period mentioned:

	RECEIPTS.			
1909.				
Dec. 21...	State warrant		$500.00	
1910.				
Jan. 21...	State warrant		250.00	
Feb. 2...	State warrant		200.00	
Feb. 11...	State warrant		300.00	
Mar. 2...	State warrant		250.00	
Apr. 2...	State warrant		200.00	
May 2...	State warrant		316.00	
June 3...	State warrant		740.00	
July 3...	State warrant		580.00	
Aug. 5...	State warrant		440.00	
Sept. 4...	State warrant		421.12	
Oct. 1...	State warrant		1,170.00	
Nov. 2...	State warrant		342.18	
Dec. 15...	State warrant		352.22	
				$6,061.52
	DISBURSEMENTS.			
1909.				
Dec. 31...	Warrant No. 96			115.75
	Premiums paid at Columbia fruit show:			
1909.				
Dec. 31...	Warrant No. 97			125.67
	Expenses of Board meeting at Columbia, Dec. 7th:			
	C. H. Dutcher	$19.76		
	T. C. Wilson	11.30		
	D. A. Turner, Sr	15.40		
	H. A. Gass	4.10		
	W. P. Stark	8.24		
	R. M. Hitt	36.87		
	W. T. Flournoy	30.00		
		$125.67		
1909.				
Dec. 31...	Warrant No. 98			52.10
	R. M. Hitt expenses as delegate to National Horticultural Congress at Council Bluffs, Ia., Nov. 15, 1909		$52.10	
1910.				
Jan. 3...	Warrant No. 99			140.00
	W. L. Howard, Sec., salary for Dec.	$100.00		
	Ruby McIntosh, salary for Dec.	40.00		
		$140.00		
1910.				
Jan. 7...	Warrant No. 100			20.00
	Columbia Insurance and Rental Agency, underwriting bond of W. T. Flournoy, Treasurer		20.00	
1910.				
Jan. 11...	Warrant No. 101			127.86
	Board meeting at Columbia, Dec. 28-31, '09:			
	D. A. Turner, Sr		16.90	
	T. C. Wilson		14.35	
	W. P. Stark		7.50	
	H. A. Gass		3.05	
	C. H. Dutcher		16.31	
	W. T. Flournoy		27.40	
	R. M. Hitt		42.35	
			$127.86	

1910.			
Jan. 11....	Warrant No. 102	.....	$40.83
	Expenses of persons appearing upon program at Winter Institute at Columbia, Dec. 27-31, 1909, and Jan. 1, 1910:		
	C. W. Steiman, Dalton, Mo	$10.00	
	F. P. Spencer, Iowa	4.50	
	S. A. Hoover, Warrensburg, Mo	8.85	
	L. A. Goodman, Kansas City	16.30	
	Dr. Z. M. Hampton, Centralia, Mo	1.35	
		$40.83	
1910.			
Jan. 11....	Warrant No. 103	.....	17.36
	J. D. VanHorn, wrapping paper	3.91	
	A. C. Ragsdole, labor, acct. fruit exhibit	6.15	
	Columbia Printing Co., printing	5.50	
	A. Fredendall, ribbons for badges	1.80	
		$17.36	
1910.			
Jan. 14....	Warrant No. 104	.....	98.83
	Hetzler Bros., cold storage	2.75	
	J. S. Summers, work on Annual Report	9.85	
	Co-operative Store, office supplies	5.20	
	E. W. Stephens Pub. Co., programs and stationery	57.00	
	W. L. Howard, cash for ribbons for fruit show prizes	2.63	
	Cash paid to H. C. Pope for sign prtg	1.00	
	Etta Gilbert, reporting institute meeting	20.40	
		$98.83	
1910.			
Jan. 27....	Warrant No. 105	.....	175.40
	W. L. Howard, Sec., Jan. salary	100.00	
	Ruby McIntosh, Sten., Jan. salary	40.00	
	Expenses of W. L. Howard, delegate to Wisconsin State Horticultural Soc. at Madison, Wisconsin	33.75	
	W. E. Camp, printing	1.65	
		$175.40	
1910.			
Feb. 4....	Warrant No. 106	.....	31.42
	Expenses R. M. Hitt attending Land Congress at Springfield and trip to Chadwick to confer with fruit growers	31.42	
1910.			
Mar. 1....	Warrant No. 107	.....	71.90
	American Multigraph Sales Co., ribbon	2.50	
	W. H. Pike, repairing typewriter	2.50	
	Expenses W. T. Flournoy and wife installing exhibits at Land Congress at Springfield	11.40	
	R. M. Hitt, expenses account of exhibit at Springfield Land Congress	29.75	
	J. F. McNallie, expenses attending Winter Institute at Columbia	18.00	
	Newman Hdw. & Stove Co., twine	1.05	
	Office Telephone for February	2.50	
		$71.90	
1910.			
Mar. 1....	Warrant No. 108	.....	140.00
	W. L. Howard, Sec., Feb. salary	100.00	
	Ruby McIntosh, Sten., Feb. salary	40.00	
		$140.00	

1910.			
Feb. 28...	Warrant No. 109		$75.00
	E. A. Remley, Postmaster, postage	$64.30	
	Pacific Express Co	2.75	
	Columbia Telephone Co., phone rent for March.	2.50	
	W. E. Camp, office work	1.65	
	Co-operative Store, office supplies	1.55	
	R. P. Scurlock, freight and drayage	2.25	
		$75.00	
1910.			
Mar. 8....	Warrant No. 110		15.62
	Postage and stamped envelopes for R. M. Hitt.	15.62	
1910.			
Mar. 25...	Warrant No. 111		140.00
	W. L. Howard, Sec., March salary	100.00	
	Ruby McIntosh, Sten., March salary	40.00	
		$140.00	
1910.			
April 5....	Warrant No. 112		60.00
	Postage and envelopes for W. T. Flournoy	12.92	
	E. A. Remley, postmaster, postage	20.00	
	R. C. Merriman, repairing typewriter	4.00	
	American Express Co	1.10	
	Pacific Express Co	.62	
	W. U. Telegraph Co	.95	
	Columbia Telephone Co., phone rent for April.	2.50	
	Amer. Multigraph Sales Co., prtg. ink	1.00	
	E. A. Remley, postmaster, postal cards	4.00	
	A. C. Page, drawings for Annual Report	1.80	
	R. P. Scurlock, freight and drayage	.74	
	American Express Co	.85	
	Columbia Printing Co., printing cards and press notices	4.50	
	Columbia Telephone Co., office phone for May.	2.50	
	W. E. Camp, multigraphing	1.67	
		$47.08	
1910.			
April 23...	Warrant No. 113		140.00
	W. L. Howard, Sec., April salary	100.00	
	Ruby McIntosh Sten., April salary	40.00	
		$140.00	
1910.			
April 23...	Warrant No. 114		24.05
	Expenses W. L. Howard to Jefferson City, account of Annual Report	5.70	
	Expenses W. H. Chandler conducting spraying demonstration at Oregon, Mo	15.70	
	Expenses D. A. Turner, Sr., assisting at spraying demonstration at Oregon, Mo	2.65	
		$24.05	
1910.			
May 31...	Warrant No. 115		140.00
	W. L. Howard, Sec., May salary	100.00	
	Ruby McIntosh, Sten., May salary	40.00	
		$140.00	
1910.			
May 31....	Warrant No. 116		50.00
	E. A. Remley, Postmaster, postage	30.00	
	American Express Co	1.10	
	W. U. Telegraph Co	1.80	
	Pacific Express Co	1.35	

May 31...	Columbia Telephone Co., phone for June.....	$2.50	
	E. A. Remley, P. M. postal cards and stamps...	13.25	
		$50.00	
1910.			
May 31...	Warrant Mo. 117.....	.....	$24.50
	J. W. Butler Paper Co., paper and envelopes..	24.50	
1910.			
June 30...	Warrant No. 118.....	.....	257.50
	W. L. Howard, Sec., June salary.....	100.00	
	Ruby McIntosh, Sten., June salary.....	40.00	
	W. L. Howard, expenses as delegate to National Nurserymen's Convention at Denver, Colo.....	72.72	
	Gardner Office Supply Co., office supplies.....	4.78	
	Pacific Express Co.....	1.45	
	E. A. Remley, P. M., stamped envelopes.....	11.44	
	Columbia Telephone Co., July rent and toll....	2.75	
	F. A. Varrelman, multigraphing.....	4.60	
	E. A. Remley, P. M., stamps and stamped envelopes.....	19.76	
		$257.50	
1910.			
July 7....	Warrant No. 119.....	.....	128.95
	Expenses of Board meeting at St. Louis June 30:		
	W. P. Stark.....	8.25	
	W. T. Flournoy.....	18.30	
	R. M. Hitt.....	35.35	
	W. L. Howard.....	17.90	
	H. A. Gass.....	11.75	
	T. C. Wilson.....	11.30	
	Expenses R. M. Hitt to Reed Springs and Cabool on Board business.....	26.10	
		$128.95	
1910.			
July 12....	Warrant No. 120.....	.....	120.72
	Sanders Engraving Co., engravings for Annual Report.....	85.32	
	C. H. Dutcher, expenses attending Board meeting and three other trips on Board business..	35.40	
		$120.72	
1910.			
July 25....	Warrant No. 121.....	.....	140.00
	W. L. Howard, Sec., July salary	100.00	
	Ruby McIntosh, Sten., July salary.....	40.00	
		$140.00	
1910.			
Aug. 1....	Warrant No. 122.....	.....	44.50
	E. W. Stephens Pub. Co., printing stationery for C. H. Dutcher.....	4.50	
	F. A. Varrelman, multigraphing circular letters.	5.15	
	University Co-operative Store, office supplies...	1.45	
	American Express Co.....	.70	
	Fredendall's Dept. Store, toilet soap.....	.30	
	Columbia Telephone Co., Aug. phone rent.....	2.50	
	E. A. Remley, P. M., stamps.....	24.00	
	Newman's Hardware Store, tacks.....	.10	
	E. A. Remley, P. M., postage.....	2.18	
	Western Union Telegraph Co., telegram.....	.35	
	R. P. Scurlock, freight and drayage.....	3.27	
		$44.50	

1910.			
Aug. 25...	Warrant No. 123	.....	$140.00
	W. L. Howard, Sec., Aug. salary	$100.00	
	Ruby McIntosh, Sten., Aug. salary	40.00	
		$140.00	
1910.			
Sept. 1....	Warrant No. 124	.....	4.75
	C. H. Dutcher, expenses to Parkville	4.75	
1910.			
Sept. 2....	Warrant No. 125	.....	20.33
	C. H. Dutcher, expenses attending Apple Growers' Congress at St. Louis, Aug. 10	20.33	
1910.			
Sept. 8....	Warrant No. 126	.....	33.65
	Expenses of R. M. Hitt to Galena, Mo., to organize a fruit growers' association	12.65	
	F. B. Lewis, collecting fruit for exhibition purposes	21.00	
		$33.65	
1910.			
Sept. 14...	Warrant No. 127	.....	350.00
	E. A. Remley, Postmaster, postage for mailing out Annual Reports	350.00	
1910.			
Sept. 19...	Warrant No. 128	.....	54.38
	Expenses of R. M. Hitt as delegate to "Show You" Congress at Moberly, Mo., and business trip to Columbia	39.80	
	W. T. Flournoy, cash advanced to G. W. Logan for special service as lecturer before a fruit growers' association at Chadwick	14.58	
		$54.38	
1910.			
Sept. 22...	Warrant No. 129	.....	214.00
	E. A. Remley, P. M., postage for mailing out Annual Reports	214.00	
1910.			
Oct. 1.....	Warrant No. 130	.....	215.70
	W. L. Howard, Sec., Sept. salary	100.00	
	Vallye Boyce, Sten., one-half Sept. salary	25.00	
	Edna McCullough, Sten. work	5.00	
	C. H. Dutcher, expenses attending a Horticultural meeting at Rosedale, Kansas	5.70	
	R. P. Scurlock, freight and drayage	13.12	
	American Express Co	2.42	
	Pacific Express Co	6.07	
	Columbia Telephone Co., Sept. phone rent	2.50	
	E. A. Remley, Postmaster, postage	45.00	
	R. P. Scurlock, freight and drayage	9.47	
	E. A. Remley, Postmaster, postal cards	1.42	
		$215.70	
1910.			
Nov. 1....	Warrant No. 131	.....	436.92
	W. L. Howard, Sec., Oct. salary	100.00	
	Vallye Boyce, Sten., Oct. salary	50.00	
	J. W. Butler Paper Co., paper, envelopes, etc.	23.92	
	Columbia Printing Co., printing stationery and bill-heads	13.00	
	E. A. Remley, P. M., postage stamps	200.00	
	R. P. Scurlock, freight and drayage	1.66	
	Pacific Express Co	4.67	
	Western Union Tel. Co., message	.55	
	Harriet Wright, addressing	2.90	
	Georgia Stean, addressing	2.25	

1910.			
Nov. 1....	American Express Co	$ .60	
	Julia Gordon, addressing	.60	
	Amy Settle, addressing	1.05	
	E. A. Remley, P. M., postage	10.00	
	E. A. Remley, P. M., deposit on 2000 two-cent envelopes	3.68	
	Columbia Tel. Co., Oct., phone rent	2.50	
	Gertrude Settle, copying	6.00	
	Hazel Settle, mailing programs	3.45	
	R. P. Scurlock, freight and drayage	7.49	
	Gertrude Settle, copying	1.00	
	Co-operative Store (P. O. Sub-Station) postage	1.60	
		$436.92	
1910.			
Nov. 5....	Warrant No. 132	.....	$127.85
	J. W. Butler Paper Co., envelopes	9.10	
	F. B. Lewis, collecting fruit for exhibition purposes	36.75	
	Gardner Office Supply Co., rubber stamp	1.00	
	Remington Typewriter Co., one typewriter complete	81.00	
		$127.85	
1910.			
Nov. 11...	Warrant No. 133	.....	120.00
	Columbia Insurance and Rental Agency, annual premium on Treasurer's bond	20.00	
	American Express Co	5.55	
	Edna Long, mailing programs	.53	
	Eleanor Pope, mailing programs	.45	
	Pacific Express Co	3.58	
	R. P. Scurlock freight and drayage	3.79	
	E. A. Remley, P. M., stamped envelopes	40.00	
	Georgia Stean, addressing	3.45	
	A. M. Douglass, addressing	3.00	
	E. A. Remley, P. M., stamps	.63	
		$120.00	
1910.			
Nov. 11...	Warrant No. 134	.....	25.00
	Premiums paid for fruit exhibit at Neosho Strawberry Congress Nov. 15	25.00	
1910.			
Nov. 22...	Warrant No. 135	.....	97.83
	Statesman Pub. Co., printing envelopes	18.00	
	W. W. Chenoweth, making office furniture	14.90	
	W. L. Howard, expenses to Neosho Strawberry Congress Nov. 15 and to Parkville Horticultural Institute Nov. 16	38.35	
	Vallye Boyce, expenses reporting Institutes	14.58	
	J. C. Whitten, expenses to Parkville	12.00	
		$97.83	
1910.			
Dec. 1....	Warrant No. 136	.....	50.00
	W. T. Flournoy, Treasurer, salary for one year	50.00	
1910.			
Dec. 1.....	Warrant No. 137	.....	216.50
	W. L. Howard, Sec., November salary	100.00	
	Vallye Boyce, Sten., November salary	50.00	
	Hugh Stephens Printing Co., printing 5000 wrappers and for clerical work mailing out Annual Report	66.50	
		$216.50	

1910.			
Dec. 2....	Warrant No. 138.....	.....	$199.93
	Expenses of W. T. Flournoy, attending Strawberry Congress.....	$5.75	
	R. M. Hitt, traveling expenses attending Strawberry Congress and Parkville Institute.....	41.18	
	E. W. Stephens Pub. Co., envelopes and programs.....	83.00	
	American Printing Co., programs.....	70.00	
		$199.93	
1910.			
Dec. 2....	Warrant No. 139.....	.....	51.01
	Mamie L. Yates, reporting Neosho Strawberry Congress Nov. 15.....	5.50	
	Columbia Herald, programs.....	12.50	
	McAlester Lumber Co., lumber for furniture...	10.43	
	Co-operative Store, dictionary and supplies.....	22.58	
		$51.01	
1910.			
Dec. 22...	Warrant No. 140.....	.....	145.61
	Expenses of Board meeting and Horti. Institute at St. Joseph, Dec. 9 and 10:		
	C. H. Dutcher.....	14.40	
	R. M. Hitt.....	37.10	
	T. C. Wilson.....	19.55	
	W. P. Stark.....	15.98	
	W. T. Flournoy.....	23.85	
	J. C. Whitten.....	10.10	
	W. L. Howard.....	24.63	
		$145.61	
1910.			
Dec. 22...	Warrant No. 141.....	.....	132.34
	J. W. Butler Paper Co., envelopes.....	75.84	
	Premiums paid at St. Joseph meeting.....	35.00	
	F. W. Manville, fruit used for demonstration purposes at St. Joseph meeting.....	5.00	
	The Thomas Cusack Co., St. Louis, sign painting for fruit exhibit at St. Louis Land Congress..	15.00	
	Amer. Multigraph Sales Co., ribbon.....	1.50	
		$132.34	
1910.			
Dec. 31...	Warrant No. 142.....	.....	250.00
	W. L. Howard, Sec., Dec. salary.....	100.00	
	Vallye Boyce, Sten., Dec. salary.....	50.00	
	E. A. Remley, P. M., postage.....	76.19	
	Columbia Tel. Co., phone rent for Nov.....	2.50	
	L. C. Goffin, multigraphing.....	6.00	
	W. U. Telegraph Co., messages.....	3.18	
	Pacific Express Co.....	7.23	
	St. Louis Basket and Box Co., baskets.....	4.90	
		$250.00	
1910.			
Dec. 28...	Warrant No. 143.....	.....	196.74
	Expenses W. T. Flournoy and wife installing fruit exhibit at St. Louis Land Congress, Dec. 15.	196.74	
1910.			
Dec. 30...	Warrant No. 144.....	.....	38.55
	Expenses of R. M. Hitt, account of fruit exhibit at St. Louis Land Congress, Dec. 15-21.....	38.55	

1910.			
Dec. 30...	Warrant No. 145	.....	$25.00
	American Express Co	$17.20	
	Columbia Tel. Co., phone rent for Dec	2.50	
	Fredendall's Dept. Store, cheese cloth	.50	
	A. A. Coult, St. Louis, photos of orchard views	1.00	
	J. F. Barham, two lantern slides	.80	
	R. P. Scurlock, freight and drayage	.98	
	Pacific Express Co	.79	
	Helen Hammond, office work	1.23	
		$25.00	
1910.			
Dec. 31...	Warrant No. 146	.....	190.04
	Statesman Pub. Co., programs	60.00	
	Whitehead & Hoag Co., premium ribbons	12.90	
	A. T. Nelson, expenses and 8 days per diem acct. of fruit show at St. Louis Land Congress, Dec. 15-21	97.14	
	Mary D. Hally, reporting St. Joseph Horti. Institute	20.00	
		$190.04	

Respectfully submitted with receipts,

W. L. HOWARD, Secretary.

REPORT OF TREASURER.

The following report shows the receipts and expenditures of the Missouri State Board of Horticulture for the period, December 31, 1909, to January 10, 1911.

W. T. FLOURNOY, Treasurer.

Marionville, Mo.

	RECEIPTS.		
1909.			
Dec. 21...	State warrant	$500.00	
1910.			
Jan. 21....	State warrant	250.00	
Feb. 2....	State warrant	200.00	
Feb. 11...	State warrant	300.00	
Mar. 2....	State warrant	250.00	
April 2....	State warrant	200.00	
May 2....	State warrant	316.00	
June 3....	State warrant	740.00	
July 3....	State warrant	580.00	
Aug. 5....	State warrant	440.00	
Sept. 4....	State warrant	421.12	
Oct. 1.....	State warrant	1,170.00	
Nov. 2....	State warrant	342.18	
Dec. 15...	State warrant	352.22	
			$6,061.52
	DISBURSEMENTS.		
1909.			
Dec. 31 ...	Warrant No. 96	$115.75	
Dec. 31 ...	Warrant No. 97	125.67	
Dec. 31...	Warrant No. 98	52.10	
1910.			
Jan. 3.....	Warrant No. 99	140.00	
Jan. 7.....	Warrant No. 100	20.00	
Jan. 11....	Warrant No. 101	127.86	
Jan. 11....	Warrant No. 102	40.83	
Jan. 11....	Warrant No. 103	17.36	
Jan. 14....	Warrant No. 104	98.83	
Jan. 27....	Warrant No. 105	175.40	
Feb. 4....	Warrant No. 106	31.42	
Mar. 1....	Warrant No. 107	71.90	
Mar. 1....	Warrant No. 108	140.00	
Feb. 28...	Warrant No. 109	75.00	
Mar. 8....	Warrant No. 110	15.62	
Mar. 25...	Warrant No. 111	140.00	
Apr. 5....	Warrant No. 112	60.00	
Apr. 23...	Warrant No. 113	140.00	
Apr. 23...	Warrant No. 114	24.05	
May 31...	Warrant No. 115	140.00	
May 31...	Warrant No. 116	50.00	
May 31...	Warrant No. 117	24.50	
June 30...	Warrant No. 118	257.50	

July 7.... Warrant No. 119	$128.95	
July 12... Warrant No. 120	120.72	
July 25.... Warrant No. 121	140.00	
Aug. 1.... Warrant No. 122	44.50	
Aug. 25... Warrant No. 123	140.00	
Sept. 1.... Warrant No. 124	4.75	
Sept. 2.... Warrant No. 125	20.33	
Sept. 8.... Warrant No. 126	33.65	
Sept. 14... Warrant No. 127	350.00	
Sept. 19... Warrant No. 128	54.38	
Sept. 22... Warrant No. 129	214.00	
Oct. 1.... Warrant No. 130	215.70	
Nov. 1.... Warrant No. 131	436.92	
Nov. 5.... Warrant No. 132	127.85	
Nov. 11... Warrant No. 133	120.00	
Nov. 11... Warrant No. 134	25.00	
Nov. 22... Warrant No. 135	97.83	
Dec. 1.... Warrant No. 136	50.00	
Dec. 1.... Warrant No. 137	216.50	
Dec. 2.... Warrant No. 138	199.93	
Dec. 2.... Warrant No. 139	51.01	
Dec. 22... Warrant No. 140	145.61	
Dec. 22... Warrant No. 141	132.34	
Dec. 31... Warrant No, 142	250.00	
Dec. 28... Warrant No. 143	196.74	
Dec. 30.... Warrant No. 144	38.55	
Dec. 30... Warrant No. 145	25.00	
Dec. 31... Warrant No. 146	190.04	
		$5,854.09
Balance		$207.43

REPORT OF AUDITING COMMITTEE.

Columbia, Mo., January 10, 1911.

President R. M. Hitt:

The undersigned committee appointed by you to audit the accounts of Treasurer W. T. Flournoy, begs leave to report that it has examined all items, consisting of warrants, bills, canceled checks and receipts, and finds no errors. The balance on hand, as shown in the Treasurer's report, we find to be correct.

C. H. Dutcher,
(Signed) D. A. Turner, Sr.,
T. C. Wilson.

STRAWBERRY CONGRESS

Neosho, Mo., Nov. 10, 1910.

FIRST SESSION.

ADDRESS OF WELCOME.

(By Mayor F. J. Bigham.)

Ladies and Gentlemen.—It seems to me that it is very appropriate that this convention should be held in Neosho. You people represent one of the very oldest occupations—the cultivation and consumption of fruit, and since Mother Eve was the first person to urge the consumption of the apple, it seems to me particularly appropriate that the horticulturists should meet in Neosho, the home of the strawberry and the big red apple.

We have a little city of 4,000 people, of which we are very proud, and we are confident that it has no equal in the United States, and I, as chief magistrate, turn over to you visitors and horticulturists the keys. I shall see that the police do not interfere; the city is yours, during your stay, and may that be long.

There are many beautiful sights in and around Neosho; the berry farms and the fish hatchery are among them.

We hope you will go and see the many beauty spots; go home and tell your friends what you have seen, that they may come and do likewise. I take great pleasure in welcoming you to our city.

RESPONSE TO WELCOME ADDRESS.

(By R. M. Hitt, President of the State Board of Horticulture.)

Ladies and Gentlemen.—There is one thing which the State Board of Horticulture desires, and that is to serve the fruit growers. We want the best meeting that may be had.

We advertised this meeting in all the towns of the southwest, and we did hope that all the people would come out. In fruit growing we are making such rapid strides that we need to meet and discuss the many questions which arise in our business. The fruit growers do not take

enough interest in what their neighbors are doing; we need to get together and find out just what the other fellow is doing. I take a great deal of pleasure in saying that Southwest Missouri is the best strawberry section in the United States.

Probably some of you have heard of the Hood River section, the place where land sells for from $1,000.00 to $5,000.00 an acre, but the time will come when we will realize more than that on the sale of our land. We want to get the men who can bring out and develop the commercial features of our business. I was supposed to make a response to the address of welcome. To those who are here I will say that I am disappointed that more did not come to our meeting; one of the things that make these meetings a success is a good attendance.

Very often a man has had an experience on his farm that is very valuable; very often a paper is read that contains valuable information; it is such discussions as these that make these meetings valuable to our fruit growers, not necessarily to Neosho, but all the growers in all the towns in our Association. If we are to have a real Strawberry Congress we must get the farmer to come, and after we get him to come, we must get him to tell what he knows, and in this way our meetings will be of benefit to each and every one.

TRIALS AND DIFFICULTIES OF A MANAGER OF A BERRY ASSOCIATION.

(By J. B. Graves, Manager Neosho Fruit Growers and Shippers' Association, Neosho, Missouri.)

This topic strongly implies that managers have trouble. In this respect they are like other human beings. Managers have to deal with a lot of people. I will mention some. They have to deal with growers, good and bad and indifferent, with buyers who have the cash, and with commission merchants who do not have the cash, some of whom have neither cash, credit nor conscience. They have to deal with crate material companies, railroad companies, refrigerator companies, express companies, electric light companies, telephone companies and printing companies. They have to deal with merchants, sawmills and banks. And last of all they have to deal with numerous helpers, from inspectors up to loaders. Not an angel from heaven could do business with, and for all these people with their varied and often conflicting interests, and under the many trying circumstances, without creating some friction and even concussion and explosion.

It is not the purpose of this paper to attempt to suggest to any manager a means of escape from trouble. The Bible says: "Man-ager is born

unto trouble." There is therefore no escape. I shall attempt little more than to talk about our trouble.

Managers have trials with the growers. It is difficult to get the members of an Association to attend the regular monthly meetings to transact business, and to discuss questions pertaining to every phase of the strawberry industry. It is difficult to get them to handle their fields scientifically from the preparation of the ground to the harvesting of the crop. It is difficult to get them to make annual reports of their acreage, to state how many acres they have newly set, how many acres they have renewed, how many acres they have plowed up, and what their estimate is of their total yield at the next season. It is difficult to get them to pick, grade and pack their fruit according to the rules of the association, which are good enough, and which, if they were strictly enforced would bring about insurrection and revolt. It is difficult to get them to submit to platform inspection and management without harsh criticism and bitter complaint. It is difficult to get them to be satisfied with the very best disposition of the fruit that can be made. It is difficult to get them to understand the market conditions during the shipping season. It is difficult to get them to understand that some varieties are worth a dollar more in the markets than some other varieties, although they may be gathered at the same time and shipped in the same car. It is difficult to get them to see that it is unfair to the growers of Aroma, to put Warfields, Haverlands, Texas and Bubachs in the same car to be prorated at the same price. It is difficult to get them to know that same berries should never be offered to the association at all, but should be sold on the street or platform for what they will bring, or expressed to some market to be sold on their merits for the grower. It is difficult to get them to understand why it is that sometimes they do not receive the reported sales, less the usual per cent for expenses. It is difficult to make them believe that there is not a graft in the purchase of supplies and in the sale of products. It is difficult to disabuse their minds of a lurking suspicion that the commission merchants and business managers are a bunch of crooks, a den of thieves, liars and rascals.

Now, what shall be done about these troubles? I have said there is no escape—no complete escape. We must figure them in as a part of our assests. There is, however, some palliation. Hence, I will venture some suggestions which, if effectualy carried out, will have a tendency towards mitigation.

In organized co-operative berry work, we are yet in our infancy. We are in the primary department of practical horticulture. Being in the A B C, or fundamental stage, we are in the formative period, the

most hopeful of all periods, the period of principles and precepts, the period of attention and application, the period of limping and learning. In a certain sense, managers should be preceptors as well as practitioners. They should encourage at least a few growers to do some right things. Right things rightly done ought to produce visible results. When the good results of right things are clearly seen, the right things will be adopted. When a farmer sees that his neighbor produces better corn by the use of good seed than he produces by the use of bad, he will get some good seed. When he sees that his neighbor makes more butter and more money by the use of pure bred Jersey cows and a separator than he makes by the use of scrub cows and a crock, he will get Jerseys and a separator. When he sees that his neighbor makes more money growing strawberries than he makes by growing corn, he will plant a field to strawberries. When a grower sees that his neighbor gets a better yield by intensive cultivation than he gets by indifferent cultivation, he will become more intensive. When he sees that his neighbor gets $2.00 a crate for his berries because he puts up a good pack while he gets but $1.00 because he puts up a poor one, he will put up a good pack. When he sees that his neighbor produces 300 crates per acre by using commercial fertilizers, while he produces but 50 crates by not using them, he will get some fertilizer. When he sees that his neighbor saves his crop from injury by the frosts by the use of heaters, while he loses his by trusting to Providence only, he will get some heaters. When he sees that his neighbor saves his plants from destruction by insects, pests and fungous diseases by spraying, while he loses his by not spraying, he will take to spraying. Now, these right things may not be contagious. They certainly are infectious. If once they can be introduced and shown to be a decided success, they will gradually work their way from member to member until the whole lump will be leavened and the right things will be generally adopted. So a manager may at least mitigate his troubles with the indifferent members by working on them indirectly through those who are interested, through those who are willing to learn and enthusiastic to practice. These things will surely come. "All things come to him who waits." That is pretty poetry. Better, "Some things come to him who works." This is practical philosophy. These things are worth working for.

Sometimes a grower expects to receive a certain price for berries which he sold on a given day. He has heard that on that day they sold for so much. But he doesn't receive what he expects. With that he is not well pleased. Then there is trouble. He has heard the truth, but not the whole truth. The cause of his trouble is a misapprehension. Misapprehension is the cause of most of a manager's difficulties. A man-

ager should make ample explanation and set forth all the facts and figures of the season's business in an annual report to the association as soon as possible after the shipping period. Such a report will serve as a sort of treaty of peace. Further, he should be willing to give additional explanation to any member at any time. When they get at first hand a clear insight into all the facts of the business, they will be better pleased with the management and the results. Then there will be less knocking and more boosting.

Managers have trials with the buyers. These trials are scriptural. That is to say, they are fiery. It is difficult to please them with the quality of the berries. They are too big or too little, too green or too ripe, too soft or too solid, too light or too dark, too wet or too dry. The boxes are too slack or too full. No matter how perfect the condition or how excellent the quality, they are never just right. It is a rare thing that they speak of them with unstinted praise. It is difficult to satisfy them with the price. While sometimes the price is accepted as about right, it is oftener objected to as being too high. We hear such talk as this: "Our market can't use berries at that price; it is entirely too high." "When the price comes down to $2.00, berries will move quickly, and our house will use two cars a day." "We can get a car cheaper down the road." "You are asking $2.65 for dollar and a half berries." "Our house is getting very satisfactory berries from Tennessee for about a dollar less money." "The Hood River berries are ripening about two weeks earlier than usual, and they are coming into competition with yours." "They can be laid down in Denver for less money than we can get them from Neosho." "Home grown berries are now coming in and they capture the market and run the price of all other berries down." "The house lost money on the last car I bought, because I bought it too high." "Tomorrow is Sunday, and the next day is Decoration day, two holidays coming together; the stores will be closed both days and no berries can be sold." "We don't want to buy at any price." These and a thousand other things are said to bring the price down. Besides, the buyers sometimes lie down on the managers. They become perfectly indifferent, go up to the hotel, sit down to round tables, envelop themselves in a cloud of aromatic smoke, play at cards until they are weary, and then go to bed.

To give the growers a faint idea of the things that entertain a manager in a busy period, I will mention a few examples. They will be fair samples of a lot more of a similar kind. The season opens. The buyers appear. Passes are made back and forth between them and the manager over the price. He cannot agree with them on the price, and rather than reduce it, he starts his car rolling and unsold, and takes the chances on

getting his price the next day before the car reaches the point of diversion. Is it best to roll? Would it be best to reduce the price and sell on the spot? What would you do?

A new buyer appears and presents satisfactory credentials as to his responsibility, and wants to buy berries, and will pay the top price. But preceding the appearance of the stranger there comes a communication from an old house in his city, warning the manager against selling to him, stating that he is a demoralizer of their market, and that they will not buy of any association that sells to him. What would you do?

A firm in Omaha wants a car, but demands protection, by which the firm means that the manager is not to sell or consign a car to any other firm in the city. It may be there are three other firms in Omaha that want to get their supplies in this district. If they find they are barred out of Neosho, they will pass on to Goodman, Anderson and Aroma, and buy berries practically the same in kind. Just as well have four cars of Neosho berries on the Omaha market as to have one from Neosho, one from Goodman, one from Anderson and one from Aroma. If the manager refuses the protection he loses the chance of selling one car, and, possibly, the chance of selling to the firm all the season. If he gives the protection he loses the possible chance of selling three and, possibly the chance of selling to some of them all the season. What would you do?

A buyer comes to the manager at ten o'clock in the moring, just a little before train time, to see if he can buy a car, and to tell him good bye. Berries are held at two-fifty. The manager at that time has one car rolling. The buyer says he cannot pay two-fifty. But, he says to the manager, if you find during the day that you cannot sell your rolling car for two-fifty and will have to take two-twenty-five, I will take it at that price. Just divert it to me and wire me to that effect. The manager finds he cannot get two-fifty, and decides to take two-twenty-five. He diverts the car to this buyer and immediately wires him. Forty-eight hours later he receives this message from the buyer: "Car arrived. I was surprised that you sent me this car. I bought one the day I left. My market cannot use two. What shall be done with your car? Shall I handle it or will you?" What would you have done?

A buyer contracts a car of berries, and when the manager ask him to give a bank guaranty he gets out of humor, turns down the bank with which the manager advises and does business, goes to another to transact his business, and finally leaves town in apparent displeasure. Is it best for a manager to safeguard his association at the expense of losing some good trade? What would you do?

Another buyer contracts a car at ten o'clock at night and agrees to

have the money wired in to the bank next morning as soon as the bank opens. The next afternoon, just twenty minutes before time to divert the car at Kansas City, the manager receives a message from the house rejecting the purchase of the car. They have bought a car from Illinois. "But," they say, "our market is strong. We will be glad to handle your car on consignment. We think you will do well to let it come on." The manager has twenty minutes in which to hunt up another buyer, to decide whether or not to let the car go on into Kansas City unsold or, whether to consign it to this solicitor or divert it to some other market. What would you have done?

Still another buyer contracts a car at the market price on that day —two-fifty. He stood on the platform and gave directions concerning loading the car. He took the car number and initials, made out the bill of lading, gave orders concerning the routing, and went up town and reported that he had bought a car at two-fifty. Late at night he found a chance to buy a car at two-twenty-five. He deliberately turned down the car he had bought at two-fifty and contracted the car at two-twenty-five. Thus the manager found to his chagrin at eleven o'clock at night that he had been shamefully disappointed, and that the car he had thought was honestly disposed of, was still on his hands and unsold. What would you have done?

It is not profitable to extend this list any further. Suffice it to say, the work of a manager is a very complicated piece of business, it taxes his ingenuity to the limit to execute it with credit and satisfaction. It is a business that requires experience. It properly belongs to an expert, a tactition, a diplomat. The intricacies of the business cannot be learned and mastered in a single season. If, after a manager has exhausted all his skill, all his tactics, all his schemes of diplomacy, all his power of manipulation, all his strength of thought and energy of action and does not overcome his difficulties and please his people, he may at least comfort himself with the hope that in spite of these things he may enter the kingdom, for they who enter there are said to come up out of great tribulations.

We read in sacred story, of a wonderful fruit land in the distant country whence, because they are so well pleased, no traveler e'er returns. In that land the orchards are planted in the fertile valleys close beside the living streams that unceasingly flow from the everlasting hills. The orchards are irrigated and cultivated without toil and without expense, and they flourish so richly that the trees never wither and the branches never perish. The trees bear not a single variety of fruit, but twelve, each ripening in its month, so that the fruit is always fresh and the supply is always full. The fruit is faultless, perfect in form and

and size, glorious in color, and exquisite in flavor. No sting of curculio is seen, no speck of fungus fever, no ugly wiggling worm. Moreover, the crops are abundant. There is enough for all. And the fruit is free alike to rich and poor. It may be purchased without money and without price. There the wicked merchants cease from troubling and the weary managers are at rest, for trials and difficulties are no more.

DISCUSSION.

Rev. W. W. Hess.—That was a mighty good paper, Mr. Chairman.

R. M. Hitt.—It is certainly evident that Mr. Graves has been through the trials and difficulties of a manager; I see a number of managers in the audience; I would like to hear some of them tell what they would have done under those circumstances; I would like to hear from some of these present.

George Logan.—I do not think I could say or tell anything new after hearing that discussion. I found that I had to please all the growers all the time. I gave up the sponge long ago.

E. A. Plank, Decatur, Arkansas.—Mr. Chairman, I have been through all the experiences that Mr. Graves has passed through, and at both ends, too. As a grower and as a salesman of the fruit, if I could not have co-operated with others and shipped my berries in car lots I would have gone home and plowed them up. I have been through all these disagreeable things that a manager must go through. The time has come when we must work together. You farmers and fruit growers are a thousand years behind the times. I say it because I am a farmer. What is the matter with us? We go to the doctor and he prescribes for us and sends in his bill the first of the month. We go to the clothing man and ask him what he will take for a certain suit of clothes. We take our produce to market and ask the dealer what he will give us for it. We are always asking the other fellow what he will give us for something we have produced. It is time we organized and told him what he must give. You and I are simple-minded enough to think we can contend with organization single-handed. What can I do single-handed? Since I have been called upon to speak on this subject, I want to tell you, you can accomplish nothing without organized effort at that. We are doing business in a day of 50 years ago. Now, I believe in putting out berries, but we must attend them by up-to-date methods. If we ever derive what we ought to derive, it will only come from organization. I have been through this fight in my local town. We would have more berries if we were all under one association. What we want is to get them all to put a shoulder to the wheel; you must work together; you

can make every man hunger for bread, get right down on his knees to the farmer. You are not so ignorant as the Italian and the Greek, yet see what they do. Everywhere they are under organization. Then why don't you organize? I don't see any reason why the farmer should not wear as good clothes as any one else; but yet the mechanics live better. They are organized. Who is to blame? Who is to solve this problem? You go up to Kansas City to your commission man. Everything is fine; everything so high we can't buy. I went to Kansas City, was met at the train in an automobile driven by a chauffeur. It was all fine. I said, who pays for all this? He said, "you fellers." I said, "you're on to things." Prices are dropping; we have just passed through an era of prosperity. If the thousands of factories should be closed up we will see idleness and tramps. You can't run this country without the farmer. But the farmers should be organized; for it is only through co-operation that we can expect to accomplish much when it comes to marketing our produce. This is particularly true of a perishable product like strawberries. Live organizations keep up the quality of the fruit shipped, and they thereby bring up the prices and keep them up. Stand by your organization.

If you let the Ozark Fruit Growers' Association go down and let every other organization go down, you are going to have hard work to get the prices you are now getting for berries.

P. A. Rogers, Manager of the Ozark Fruit Growers' Association.—It would be hard for me to add anything to what has already been said. I was delighted with the paper read by Mr. Graves. He shows that he himself is one of those that he mentioned in his paper and one of those which the Prophet John told about, "That we, through much tribulation must enter into the kingdom."

(The speaker next cited several incidents in his own experience as a manager.) There is no doubt but what organization is the salvation of the fruit grower. This has particular reference to the grower of strawberries.

R. M. Hitt.—I think the big majority of truths have been brought out, but there is one other thing. Mr. Graves spoke of keeping a record for the growers to look at. If you keep a record and leave it open and invite them to see it, it inspires confidence in the management. Where the buyer purchased a car for $2.50 and another for $2.25, I would have sold the car for $2.50; I would have sold for the biggest price. If we work together we can bring the buyer to us. If there is a scarcity of certain products in your locality, then you are entitled to the profits. Not long ago the broom corn manufacturers claimed a scarcity in broom corn; the farmer did not know of this and the manufacturer got the

profit on the broom corn. We hear so much of scientific departments and educational institutions. They are teaching us how to make two blades of grass grow where only one grew before; but do not tell us what to do with the two blades after we get them. We must give more attention to the better marketing of what we grow. This is done through organization and co-operation.

SECOND SESSION.

OVERPRODUCTION OF STRAWBERRIES.

(By Judge George Hatzfeld, Neosho, Mo.)

Mr. Chairman.—When the subject of "Overproduction of Strawberries" was presented to me for discussion at this meeting, I did not think that much could be said, for in all the years in which I have been manager of the Southwest Missouri Fruit Growers' Association there never has been a season of overproduction, nor do I think there will be —provided we follow some simple but very important rules which, in the business world of today, are acknowledged to be indispensable to success in any large business enterprise.

The strawberry industry of Southwest Missouri today includes thousands of growers who have planted from a small patch of a few square rods to from 50 to 100 acres. To many of these, the strawberry crop means either success or failure; success—if a good crop, well handled; failure—if untoward circumstances or climatic conditions reduce the output so it will not pay expenses. The crop for the season of 1911 promises now to be one of the largest ever handled in Southwest Missouri, and it behooves us to look over the situation to prevent, if possible, what is often called an overproduction, but in reality is a poorly distributed crop of strawberries.

The strawberry crop of 1911 for Southwest Missouri is now (if nothing intervenes between now and picking time) variously estimated at from 1,500 to 2,000 cars. The main crop is handled in from 12 to 15 days. This means that some days we will have over 200 cars for distribution in Southwest Missouri alone. Now, if distributed judiciously, this number, great as it is, would not glut our markets if it was not that the states of Illinois, Kentucky and Tennessee, each with as large, or nearly as large, an output, will compete with us in the markets of the north, northwest and east, and the competition that arises from these states

might bar us effectually, if the strawberries we ship out from Southwest Missouri are not of the highest excellence. To attain this excellence and maintain it, must be the aim of every grower of strawberries and of every association. We must strive to put up a pack and a package that is honest. The package must be made up to be attractive and made of good white material, the pack must be of the best berries only; all through alike from top to bottom, and boxes well filled. A car loaded with such berries will always sell, no matter how many cars of poor or indifferent berries are on the market, and the fruit will always sell for a good price, while at the some time poor berries will have to be sold at a loss to the producer.

In handling a very large crop, the right kind of distribution may mean the difference between profit and loss. If a car is shipped into a market already overstocked with strawberries, it will cause a demoralization of prices, while on the other hand, a car goes into a market that is cleaned up of its old stock, the price paid in this case is satisfactory to the commission man as well as to the producer.

Now the question arises, how can we guard against the first mentioned state of affairs, and how can we take advantage of the second proposition? I answer by having our own representatives on the spot and have them report every day to us the condition of the markets in every distributing center of our shipping territory. These representatives at the same time if a car comes in that is not sold can sell it, or if the market is off, ship it on to a market more favorable. In receiving these reports we know what markets to ship to and what markets to stay away from. The contingency might arise that with most of our best markets glutted, we may be compelled, in order to clear the situation, to ship a number of cars outside of our usual range of distribution, and may mean a loss on account of high freight and refrigeration charges, yet in the end it will prove to be a wise move, as it will have prevented utter demoralization and glut in our best markets.

But to have a representative in every important market will be a great expense and could not be thought of by a single association. But by co-operation of all associations this expense can be reduced and will be only a trifle as compared with results. In addition to being reporter and salesman, these agents can collect your accounts, report condition of your car on arrival, and if your car is billed to go farther, if the berries are in condition to go on, or ought to be disposed of on the spot. They report to you if your car came in on time or a day or two late, thus giving you notice in time of any delinquency on the part of the railroads. They will see if your car was properly iced when it came in, and in case of a partly wrecked car you have them there to estimate the damage.

Thus you will realize what a valuable asset this corps of agents is to an organization.

Now let us go back to our subject and summarize. What can be done to guard against overproduction? First, the grower must thin out his rows, remove the weak plants and only leave those of strong, healthy growth in order to get fine fruit. Second, the grower must watch that only the best berries go into his pack, for if a few growers are careless in this respect it may spoil the sale of a whole car. Third, inspection in the shipping shed must be rigid, and all berries not coming up to the standard must be refused or disposed of otherwise. Fourth, we must demand of the railroads that they furnish us with good cars, well cooled and ventilated. Fifth, to obtain best results, it is necessary for growers and associations to co-operate. Sixth, to make co-operation effective and practical, it is necessary to have a general office with manager and secretary. Seventh, the general manager to have a corps of representatives in the markets.

Mr. Chairman, when some fifteen or sixteen years ago a few strawberry growers organized for the purpose of marketing their berries in car lots, we never thought that the business would reach the proportions and importance of the present time. But even at that time, we knew that co-operation was indispensable for success. Then it meant only organization of the growers in order to get enough berries to ship in car loads. We did not think then that we could sell on track so perishable a product as strawberries. We took all the risks, we consigned our cars to some commission house and sometimes we received good returns and sometimes nothing worth mentioning, and sometimes we had to pay freight and refrigeration charges in addition to the loss of our berries. In spite of these conditions, the strawberry business expanded, but the more we grew the more intolerable became the system under which we were doing business. Some of us then said that we would not stand this any longer; that if we could not sell our berries at home we would quit raising them. Some of us sold on track and others kept on consigning. We who sold on track soon found that this way of doing things was a long way from being perfect. In the first place, we had too much competition from those associations that shipped on consignment. The commission merchant receiving berries from them, having nothing to risk, could sell the berries at any price, but the merchant paying out his money, had to take all risk himself, hence was not willing to pay a big price for what he bought for cash. And the different associations being all independent of each other, and therefore had no market price, the manager, in most cases, would, if he wanted to, make a sale, take what he could get, satisfied if the proceeds paid expense and a scant profit to

his growers. Often we could not sell and the consignments, as a rule, took away what little profit we made on sales. Now, in seasons of short crops, our way of doing business was feasible, but all of us knew that with a large crop on our hands, we would be left. What we lacked was this—a uniform price for our berries, the means to ascertain the distribution of them, a uniform pack, a uniform package, and last, but not least, a head, a general office with a general manager. In short, we needed organization and co-operation of associations.

We held several meetings and discussed the situation from every standpoint, and the outcome was the organization of the Strawberry Association of Southwest Missouri and Northwest Arkansas. The Northwest Arkansas associations have since withdrawn, and all associations of Southwest Missouri, with the exception of three or four, now all belong to the general organization known as the Ozark Fruit Growers' Association. Under the able management of this organization, the strawberry industry has prospered, and we no longer are awed by the cry of overproduction of strawberries. For it is as true with strawberry growers and association as it is with nations—"United we stand, divided we fall."

DISCUSSION.

J. B. Graves.—Mr. Hatzfeld's paper suggests that there ought to be higher prices for berries in the future.

E. N. Plank, Decatur, Arkansas.—Along the line of these subjects that have come up, I would like to call your attention to the change of conditions that have taken place down the line. Several years ago Van Buren was growing the Michel berry extensively. At that time I was manager of the Northwestern Arkansas section, and they grew the Michel, a middleseason berry, mostly. I was always opposed to the Michel berry, and tried to get them to plant the Klondike, and after a long struggle succeeded in changing our section. Now the Michel berry with us, for commercial purposes, was a failure. Van Buren changed to the Klondike and Texas. For many years frost took 80 per cent. of our berries. This largely put us out of business. We only shipped three cars a season when our town should have put out a car a day. Siloam Springs, Springtown, Felkner and other places have gone to raising the Aroma berry on a large scale. One man in Gentry took the matter up and put out 40 acres last year. At Decatur and Gravette 100 acres were put out, the same amount at Sulphur Springs and at Noel 75 acres. Aroma has now almost replaced the Michel. People have told us that we should put out the midseason berry; I have long been an advocate of the mid-season berry, but we are going to grow the berry that makes us the most money.

Things have changed. Neosho now ships the same time that we do. By organization you can ship from all these towns and you can distribute your berries over all sections of the country.

I appeal to you fruit growers of Southwest Missouri to do your best to get an association; if you farmers want to be successful, you must go at it in a business-like way, you must have method.

There are two ways of overcoming overproduction: First, proper distribution; and, second, by growing a better quality of berry. Organization is positively necessary for the first and will largely bring about the other necessity.

THE CAUSE OF HIGH PRICES OF BERRIES DURING THE SEASON OF 1910, AND CAN WE EXPECT THEM TO CONTINUE IN THE FUTURE.

(By R. M. Hitt, President of the State Board of Horticulture, Koshkonong, Mo.)

(Note.—This subject was assigned to J. Ed. Roark of Anderson, but in his absence Mr. Hitt was urged to take the vacant place.—Secretary.)

As I see it, the high prices of 1910 are due to the following causes: First, scarcity of production; second, increased demand; third, organization in Southwestern Missouri.

During the past season there was no more produced than at many times in the past but there was a better demand. This will continue to be true as the years go by and we can increase the production each year to meet the demand. When the season first opened here this year it looked as if Southern Illinois and Tennessee would interfere with our market, because these berries are cheaper than ours. However, the Tennessee berries did not possess the quality and hence were not serious competitors.

Our territory of distribution is gradually being extended and enlarged, owing to the increased demand. The Missouri berries are now shipped to all points in the north, south, east and west. Last season we shipped to Denver, Buffalo, Oklahoma City and Winnipeg, Manitoba. We must ship to all points in car load lots. This makes the berries cheaper to the consumer and more of them are used. Also, the growers realize just as much as if sent by express at higher prices. The town of Moberly will handle a car of berries a day. They never did get enough.

Last year the crop was properly distributed. I do not know what your berries would have realized without our methods of handling them. When dealers are getting berries on consignment they will let them accumulate on their hands, and this reduces the price, and no one wants to

buy. Whenever the fruit we raise is put on a proper selling basis, then the question of market has been solved. We should profit by the history of the Michigan grape growers. They at first shipped across the lake to Chicago, and Chicago soon began distributing to other points. The growers waked up later to their opportunities and began doing this for themselves, but it required organization to do this. The raisin growers of California had the same difficulties, and the strawberry producers of Southwestern Missouri are now facing similar problems. We cannot compete with each other and expect to be able to compete with other strawberry territories. In some towns in Missouri a few shipped independent of an organization and now the organizations are holding umbrellas over them to keep them from getting wet when it rains.

With the present and prospective large acreage in Missouri and Arkansas, prices may decline somewhat, but not enough to do any one harm. As the price declines consumption soon doubles. If the cities are depended upon to use all the berries at high prices there may then be an overproduction. But the smaller places must be supplied, and if prices are within their reach they will use enormous quantities. Prices will be governed by amount produced if properly distributed. It is my firm opinion that if we live up to our possibilities in the way of organization and proper distribution, that prices in Southwest Missouri in the next ten years will not decline enough to hurt anybody.

DISCUSSION.

P. A. Rogers.—Nothing hurts so much as to build up great air castles and then not be able to realize our expectations. I am naturally conservative in my views, I do not think that you will get as much this next year as you have in the past. Present prices will no more continue in the future than will the present prices of hogs and cattle always remain as good as they have been the past season.

One other point I would like to bring out and that is to keep the quality up. I once had a peach deal on in St. Louis for the growers in Arkansas and East Texas. The St. Louis market was filled with Georgia, Arkansas, Louisiana and Oklahoma peaches. I had to sell my peaches, so I put an ad. in the Globe-Democrat; the results were satisfactory; I did not have enough peaches to fill all orders. If you want to get your berries to the people, notify the people that you have the quality. That is the solution of that problem. If you are going to build a house, sit down and figure the cost and see if you can afford the expense. Similarly, if you don't think you can grow berries for $1.50 a crate you had better stay out of the business.

HOW TO SECURE A BIG YIELD OF STRAWBERRIES.

(By G. E. Dorrence, Neosho, Mo.)

I will give my experience with a strawberry crop grown on one and one-half acres of ground, consisting of one and one-fourth acres of berries and one-fourth acre of plants, during the seasons of 1909 and 1910, on my farm two miles northeast of Neosho, Mo.

This piece of land is stony, but the soil is very rich. It has a southeasterly slope, and is partly protected on the west, but unprotected on the north. I think this is the best location, as the north wind blows the vapor over and it does not settle on the berries and cause frost. This was once timberland. After clearing, it was cultivated in corn a few years, then seeded to clover and used as hog pasture for three years, and then as a feed lot for hogs for three years more.

I will explain how the berries were planted and cultivated. The land was first broken or turned with a turning plow, four inches deep, the last of February. There had been one freeze which had killed nearly all the grubs. I began harrowing soon after, and went over it about eight times with a spring-tooth harrow. Each time the teeth of the harrow went down as deep or deeper than it had been broken. By this time the soil was pulverized through and through, leaving no clods or sods underneath, which is not good for any plants or grain to be planted upon. On the fifteenth of March I began setting out the plants, placing them three and one-half by four feet apart. I used a line with knots to divide the space. The plants were set fan-shape, the roots straight, not doubled up or turned back, with the crowns level with the top of the ground, and the dirt packed firmly around them. I selected well-rooted Aroma plants that were grown between the rows of a new berry bed that had not fruited. They were grown on land similar to that which I have just spoken of.

Now for the cultivation—the most important part. Soon after setting I began cultivating with an eight-shovel cultivator, once each way the same day, following with the hoe, and dressing up around the plants. We continued this after each rain as soon as dry enough to cultivate. By the time they had been cultivated three times, they began to make runners, so the cultivating was one way of the row, with a common four-shovel cultivator, stirring the ground as deeply as it had been broken. This threw the dirt slightly around the plants. We followed with the hoe, placing all runners and covering them with enough dirt to start new plants. By letting them alone twelve days we had a row a foot wide. This was about July 20th. We then used a one-horse cultivator, the row

or bed being too wide for two, going twice between the rows, cultivating just deep enough to hold moisture, and cover the runners very lightly. About September first we cultivated them the last time, going one time between the rows. By that time the rows were about 32 inches in width.

At harvesting time this one and one-fourth acres yielded 383 crates, averaging $2.22¾ per crate.

Gross sales of berries	$853.64
Cost of crate material and picking berries	180.00
Net income from one and one-fourth acres of berries	$673.64
For plants sold from one-fourth acre	124.00
Total net returns from one and one-half acres of ground for the season.	$797.64

On an acre basis, the returns for the season were as follows:

Yield of berries	3,064 crates per acre
Net cash returns for berries sold	$538.88 per acre
Cash returns for plants sold	$496.00 per acre

DISCUSSION.

J. B. Graves.—This was a remarkable yield; the best reported this year. However, it should be remembered that this piece of ground had been in clover for three years; had been used for pasturing stock and was constantly receiving fertilization. The soil was very rich and should have produced well. It has been said that we produced more berries a year ago than we do now. Some growers complain of too much rain, but frost is the greatest thing we have to fear in this locality. We have frosts in the springtime and the strawberry growers are interested in knowing how to escape damage from this source. They can save their crops by smudging, and this is being introduced and experimented with in this locality. The next paper will tell us how this is done.

EXPERIENCE IN SMUDGING STRAWBERRIES.

(By Charles Staib, Neosho, Missouri.)

During a period of seven years I have been raising strawberries with good results, until two years ago last spring, when the frost killed about sixty per cent of my berries, and one year ago last spring, the frost damaged about forty per cent.

For some time I had read in the "Fruit Grower" of St. Joseph, Missouri, about orchard heaters, and that they had been used for smudging orchards in Colorado and California with good results. After cor-

respondence with orchard heater manufacturers, I purchased 300 No. 1 Troutman heaters, holding five quarts of oil. I placed the heaters in my berry patch as follows: 100 pots to the acre, and 200 pots to two and one-half acres, or 80 per acre. After receiving the heaters, the Waters-Pierce Oil Company of Neosho offered me crude oil for smudging in tank lots of 7,000 to 8,000 gallons at two and one-half cents per gallon. Not being able to use a full tank, I bought 700 gallons of fuel oil in barrels at the rate of six and one-half cents per gallon.

Now I was ready for Jack Frost. Toward the latter part of April last spring, a cold wind from the north arrived with signs of coming frost. At half past twelve o'clock that night the thermometer registered one degree above freezing, and we lighted one-half of the number of pots. After one o'clock the mercury registered one degree below freezing, and we lighted the balance of the heaters. All of the heaters burned about two hours. Inside of the berry patch the thermometer registered two degrees below freezing, and outside of the berry patch, six degrees below freezing. After three o'clock we refilled the pots for the reason that when they were full they produced more heat. After four o'clock the temperature outside of the patch was twenty-four degrees where there were only eighty pots per acre.

About one week after this freeze there was another frost, but not so bad as the first. This time we lighted the pots at two o'clock a. m., and the heaters kept the temperature up to two degrees above freezing until morning, at which time the thermometer outside of the patch registered five degrees below freezing.

These experiments taught us that we need 125 to 150 pots to the acre to protect the bloom and berries fully from a frost of 24 degrees above zero.

RESULTS OF THE SMUDGING.

The following brief summary may be given of the results of the smudging: From one acre where I had 100 pots to the acre, we picked 245 crates of fancy berries. From two and one-half acres, where we used 80 pots to the acre, we picked 460 crates of berries, or at the rate of 184 crates per acre. From three acres where I used no heaters, we picked a total of 290 crates, or at the rate of 96 2-3 crates per acre, and there were lots of buttons.

Reviewing the results and placing everything upon an acre basis, the principal facts may be thus set forth:

One hundred heaters per acre raised the temperature five degrees. Eighty heaters per acre raised the temperature four degrees. At another time the temperature was raised seven degrees.

Where eighty heaters were used, the cost was as follows:

Heaters	$16.00
Oil	12.11
Total	$28.11

Where one hundred heaters per acre were used, the cost was:

Heaters	$20.00
Oil	15.14
Total	$35.14

The following figures show the yield of berries when heated and not heated, and the gross sales from the fruit:

Where 100 heaters per acre were used, the yield was 445 crates per acre.

Where 80 heaters per acre were used, the yield was 184 crates per acre.

Where no heaters were used the yield was 96.6 crates per acre.

Where 100 heaters per acre were used, the 245 crates produced, sold for $551.25 gross.

Where 80 heaters per acre were used, the 184 crates produced, sold for $414.00 gross.

Where not heated, the 96.6 crates per acre produced, sold for $113.32 gross.

One hundred heaters per acre increased the yield 148.4 crates per acre.

Eighty heaters per acre increased the yield 87.4 crates per acre.

Deducting the cost of crate material and picking, amounting to $144.00 per acre, and the cost of heaters and oil, we have the following results:

Cash net profits as a result of heating with

100 heaters	$258.79 per acre.
80 heaters	128.67 per acre.

It should be remembered that the heaters, with good treatment, ought to last four or five years, or longer. When all danger of frost is past in early summer, the heaters should be dipped in crude oil and stored away under shelter.

DISCUSSION.

Mr. Richardson.—What distance from the ground does he have his thermometers?

Mr. Staib.—About two feet.

Mr. Thomas.—How about the size and quality of the berries where heated?

Mr. Staib.—The berries were much larger and finer; very few buttons.

Mr. Nutting.—How many heaters are necessary to fully protect the crop, and the value of the oil used?

Mr Staib.—From 125 to 150 heaters per acre should insure complete protection at all times. Fuel oil in tank car lots costs 2½ cents per gallon. By the barrel it may be bought at from 5 to 7 cents.

J. L. Pelham, Hutchinson, Kansas.—Have you ever taken any means to deflect the flames so as to give more protection on the ground?

Mr. Staib.—I have not, because the wind and cold air throws the flames back towards the ground.

J. L. Pelham.—Last year I tried to deflect the flames by putting a lid with three legs over the pot. It was a failure, because the soot would collect under and against the lid, finally smothering out the pot. In the end, I had to cut off the legs and remove the lid. Mr. Staib stated that he did not refill until the oil had burned two-thirds out, and in the meantime the temperature had gone down. I think it was a mistake to wait. The oil should not burn more than one-third out before refilling. I keep my temperature above freezing.

Dr. Howard.—The problem of heating to prevent frost injury is different in the case of berry fields to what it is with orchards. In heating orchards we can get along with a less number of heaters, but if strawberries are in the orchard it would be the same. In the orchard the branches and foliage help to hold the air stationary near the ground; these obstructions help to keep the warm air from moving away. In the berry field it is different. I am a firm believer in the value of orchard heaters.

R. M. Hitt.—What about plants purchased from R. M. Kellogg & Company of Michigan? Are they as good as the natives?

J. M. Propst.—It would be better to leave them alone.

Mr. Richardson.—They are all right. They may not produce the first year, but they will later on.

Mr. Walker.—The plants I bought from Kellogg were a failure.

Mr. Lawler.—I found the Kellogg plants to be no good by the side of natives.

Mr. Thomas.—I have never tried Mr. Kellogg's plants, but know of neighbors who have had success with them. Would Mr. Kellogg's or Mr. Any-body-else's plants suit us as well as our own plants? From the north, they dry out by the time they reach use.

J. B. Graves.—Growers have different experiences with plants from the same nursery. The results secured are sometimes due to the distance apart they set them; the weather conditions, etc. Don't say discouraging things about a house because you have made one failure. However, it stands to reason, if you get plants from a firm nearer home, the results will be better.

J. R. Haldeman.—The environment is what makes us all. Plants are like people, and the environment is what makes the plants. If Mr. Hopkins has the finest plants and the finest berries, the secret of the whole matter is that Mr. Hopkins knows how to produce those effects.

Getting back to the discussion of Mr. Staib's paper, Mr. Propst was asked about his experience in smudging.

J. M. Propst.—I made the biggest fires I could build; the air was full of smoke, but I lost every berry blossom. The next year those plants overbore themselves.

J. R. Haldeman.—In smudging, smoke does more good than heat. Don't have too much heat, as we find by experimenting that too much heat tends to cause an upward current of air, and the heat is lost to the surface of the ground.

Dr. Howard.—Do not depend upon the smoke. In nine cases out of ten it will float away and do you no good. It is especially useful in valleys, but on the hill tops, level places and rolling land, plenty of heat is what is needed to save the crops. Smoke is good when it stays, but it is too unreliable.

Question.—How about spraying plants to make them more resistant to cold?

Mr. Propst.—The value from spraying is to make good, healthy plants, and these will be hardy. Weak plants may be incapable of flowering.

Robert Lyles: I want to say that my experience with the Aroma plants is that they are such scanty foliage producers that the leaves do not protect the berries. The Michel protects much better. Can't we fertilize and secure a better plant growth for frost protection purposes? I believe this to be feasible. I have used a balanced berry fertilizer with check rows and will know the results next year. The foliage seems to be much better where fertilized.

Mr. Holmes (agent for a fertilizer company).—Now, we had the same experience in Kansas City before we tried fertilizing. In regard to

plants from Central Iowa, South Missouri and Kansas City, would say that local berries did the best all the way through. Iowa berries failed; South Missouri berries came in too early. We think the special fertilizer, called "Trucker," is the best for berries in the Neosho district. This mixture consists of three per cent ammonia, six per cent phosphoric acid and four per cent potash. Three per cent of ammonia is good for poor clay land. The use of fertilizers is of ancient origin. Among the oldest fertilizers used may be mentioned guano, fish and ashes. The first is rich in nitrogen (ammonia), the second, both nitrogen and phosphoric acid, and the last is a potash fertilizer. Do not use too much nitrogenous fertilizer (rich in ammonia) on strawberries, as it makes mushy fruit.

Mr. Forber.—I have experimented with fertilizers on strawberries. I used 400 pounds of Strawberry Fertilizer per acre, and I believe I have the finest patch in the country.

Mr. Frazier.—In McDonald county we used 500 pounds of the Strawberry Fertilizer per acre.

NURSERY AND ORCHARD INSPECTION.

Secretary Howard called the attention of the meeting to the fact that the State Board of Horticulture was trying to secure some needed legislation which would provide for the annual inspection of all nurseries and the continuous inspection of orchards. The proposed bill providing for this being very long and tedious to read, the following summary was given:

An act to prevent the introduction and dissemination in Missouri of dangerously injurious insects and plant diseases, and repealing inconsistent acts named therein, and appropriating funds for carrying out the provisions of this act.

Section 1. The State Horticultural Inspector of Missouri will be required to inspect every year, between July 1st and October 1st, all the nurseries of Missouri, and if found clean, the owners will be given certificates. If any nursery is found to be infested with dangerous insects or diseases, or in danger of becoming so, he may prescribe certain precautions or treatments, and the owner must observe them. Nurserymen must attach certificate of inspection to each package of plants sold. Certificates may be revoked for cause. Nursery men will be allowed to use their certificates for shipping stock not grown by them, provided it was inspected where grown. The State Horticultural Inspector must furnish the nurserymen of the state a list of all the inspectors of other states and countries. Every agent for Missouri nurseries or others will be required to file a sworn statement that all of the things he is selling have been duly inspected. If acceptable, he is then given a regular certificate. Violation of this is a finable offense. (See Sec. 5.)

Sec. 2. All shipments of nursery stock within the state, or coming into Missouri from other places, must bear certificate of inspection. Transportation companies must inform the State Horticultural Inspector of any shipments not bearing inspection certificates. Violation of this is a finable offense. (See Sec. 5.) Certificates from inspectors of other states are to be accepted.

Sec. 3. If the State Horticultual Inspector believes that any nursery, orchard, fruit plantation or other property in Missouri is infested with diseases and insects to such a degree as to be dangerous, he is authorized, during business hours, to go and make an inspection and prescribe treatment. The owner must follow the directions given him, or be liable to a fine.

Sec. 4. The administration of the inspection law is to be under the direction of the Missouri State Board of Horticulture and the State Horticultural Inspector appointed by that board, and the expenses are to be paid by the Board from funds to be appropriated by the state for that purpose. The State Horticultural Inspector will be given necessary assistants. He will also be required to make an annual report to the Board of Horticulture.

Sec. 5. Violations of the inspection law are to be punishable by a fine of not less than $25.00 and not more than $200.00.

Sec. 6. This provides for repealing any or all laws now in effect which may be in conflict with the foregoing sections.

Judge Hatzfeld.—Mr. Chairman, I would like to introduce a resolution.

Resolved, That it is the sense of the fruit growers of Southwest Missouri that the proposed bill providing for the inspection of nurseries and orchards of the state be approved as drawn; and be it further

Resolved, That we second the efforts of the Missouri State Board of Horticulture in trying to get the said bill enacted into law by urging its favorable consideration by the members of the Forty-sixth General Assembly of Missouri.

Unanimously adopted.

THIRD SESSION.

SPRAYING STRAWBERRIES FOR RUST.

(By Dr. E. L. Beal, Republic, Mo.)

It won't take very long to tell what I know about spraying strawberries for rust, but the experience of last year with one spraying produced such striking results that not only I, but my neighbors as well, became greatly interested in this method of preventing the destruction of our crops of Gandy from this pest. In testing a great many varieties of berries, I have found considerably more than half of them suffer from rust—some slightly, and some so severely that the crop is almost ruined; while others, among them the Aroma, are almost entirely free from it. There is no certainty, however, that it will continue to remain free from it. Sample, Warfield and Gandy have been more or less damaged from rust every year for several years past, hence, if we expect to raise and market full crops of fancy berries we must not only cultivate and fertilize, but we must get rid of anything and everything which interferes with this result.

Rust is a fungus disease which, in a general way, behaves much like apple scab. It is seen on the leaves and stems of strawberry plants at

almost any time of the year, but gets much worse in the latter part of the spring and early part of the summer. The damage to the foliage unquestionably causes weakness and loss of vitality in the plant, and impairs its power to properly mature the fruit. Spots appear on the leaves, and as far as the spot reaches, the leaf is dead and its breathing power destroyed. When it reaches the stem which supports the berry, the circulation stops, the calyx dies and the berry does its best to color up and look ripe, but it is not ripe, and it is of any size it happens to be when the rust gets on the stem. They look old, more or less shriveled, something like they had been too near the fire. They have scarcely no flavor, sometimes rather a bitter taste. In fact, they are nothing but culls and you cannot make anything but culls out of them.

Last spring I decided to spray. I did not get my machine in time to give them the first spraying, but gave them a good dose of 4-4-50 Bordeaux mixture just before the blooms opened. My plot contained 14 acres of Gandy, and through it there were 29 rows of two-year old apple trees. It was not very convenient to spray the tree rows, so they were left unsprayed. Three acres of this ground was new, and the balance old, but at no time could I tell any appreciable difference in the test whether the ground was new or old. Now for the results. At the time of spraying the foliage on the entire field was fresh, bright and vigorous, with just a little rust here and there. The tree rows looked fully as good as the balance, and the prospect was very flattering. (This was before the freeze.) When the berries began to ripen, there was still no difference in the rows. But when the days began to get hot the apple tree rows began to fail. The hands noticed it as soon as I did and nobody wanted to pick a tree row, and they had to be abandoned at least a week before we quit picking. I feel confident the one spraying I gave them increased the yield, or I should more properly say, saved fully 25 per cent. I really think the percentage was greater than this. Now, had I been able to spray twice instead of once, I think I may conservatively say the saving would have been 10 or 15 per cent greater than it was.

Next spring I shall spray with 5-5-50 Bordeaux mixture just as soon as the first signs of growth start in order to thoroughly reach all rust on the dead leaves and stems. Then with the same mixture, I will give them another dose just before the blooms open and the apple tree rows won't be neglected this time, except just enough to check the results. I use a Hardie outfit with the strawberry attachment, and take five rows at a time. If the mixing tanks are convenient, 30 or 40 acres a day can be treated at a cost of about 75c per acre for each spraying. This does not include the use of the sprayer.

DISCUSSION.

Question.—When do you spray the plants?

Dr. Howard.—He sprays in the spring, just before the leaves are out.

J. B. Graves.—I know that spraying has been very beneficial in our apple orchards. The time is here when we can spray strawberries as well as apples.

P. A. Rogers.—I would like to say that Dr. Beal's paper is very fine. I saw Dr. Beal's field, and the results from spraying are astonishing.

Question.—Are the good results of spraying limited to the year when spraying is done?

Dr. Howard.—You will get better results from plants next year if the leaves have been made healthy this season. It would enable the plants to make a stronger crop for the reason that buds are formed in July and August to make the next year's crop. We sometimes forget that we have got to look a year ahead. It required healthy leaves to form fruit buds.

Robert Lyles.—How much of this spraying mixture will be necessary to spray once?

Dr. Howard.—I am not familiar with Dr. Beal's process of spraying. Perhaps there is someone here who can tell you what kind of a sprayer he used.

Reply.—A 2½ horse power engine.

Mr. Rogers.—It costs 75c an acre.

George Logan.—I have sprayed strawberries with gasoline engine sprayer, using 50 gallons of the 4-4-50 Bordeaux mixture per acre. The first application was given when growth started in the spring and another after they were through blooming. This treatment entirely controlled the rust.

SHED PACKING OF STRAWBERRIES.

(By R. F. George, Manager of the Pierce City Association, Pierce City, Mo.)

About fifteen years ago the strawberry first became a commercial product in Southwest Missouri. At that time, Sarcoxie was the only strawberry town in the country. Now this luscious first spring fruit is grown quite extensively all over Southwest Missouri and North Arkansas. In the beginning of the industry, the methods of handling were necessarily crude and unsatisfactory, yet the business grew and became profitable from the simple fact that the demand was far in excess of the supply. In all these years since the first shipments, there have been great improvements made in all lines; especially in that of refrigeration and transportation. In fact, the railroad and car line people have taken quite an

interest in our business, and we think it is up to us as growers to deliver to them a fine package of sound, well-packed fruit. It will not be difficult then in case of bad condition on arrival at destination, to establish a just claim for our loss. This will show them that we are doing our part and will be quite an inducement to them to meet our requirements of prompt and efficient service.

A few of our associations have established fairly good reputations already with the trade, and are having no trouble in disposing of their product at from 15 to 35c premium over the average price. This proves the utility of the scheme itself. But there are other reasons: The grower who puts up a nice outside appearing crate of berries, but which, upon examination, is found to contain imperfect and decayed fruit, with the best on top, is not promoting that mutual confidence between buyer and seller that should prevail. In other words, he is injuring the business, and it is not treating the good packer right.

Again, the commission merchant who puts his money into strawberries at the grower's end of the line, has a right to the assurance of sound and perfect fruit, well packed, in order to reduce the danger of loss to the minimum and to rightfully establish any claim that he might file in case of improper refrigeration or other damage on arrival at destination. Then again, we are all aware of the rapid extension of the strawberry industry from year to year. At present it is assuming vast proportions. It is beginning to look gigantic. In view of this fact, would it not be well to adopt methods and measures that will reduce the quantity by improving the quality? Do you not think it wiser when overproduction is apparently close at hand to ship, say three-fourths to four-fifths of a crop of strictly prime to fancy fruit, than to force a full crop of poorly packed and ungraded stuff on any market? For example, look at Western Tennessee. She shipped a large crop of poorly packed berries last year, and wherever she came in contact with Southwest Missouri berries she sacrificed from 50c to $1.00 per crate. These people will not soon forget this lesson, and do not believe for a minute that they will not set about doing things differently in the future. The opportunity is yet ours to command the markets. In order to do this, we must grade and pack in exact uniformity all over our district. Require each and every grower to pack nothing but sound and perfectly formed fruit. Cut out all dirty or sandy berries and fill our packages good and full. We can then go into the market in a class by ourselves, for it is a fact, which has been well proven, that Southwest Missouri grows the finest flavored and most highly colored strawberries in the United States. When the Missouri Aroma berry season opens, the other sections turn pale with envy, for the commission man hies himself hence and is found with them no

more until winter's icy grasp is broken and another spring returns.

Now, in order to accomplish what we have set forth above, we must absolutely cull the berries at the packing shed, for we all know that the average picker is interested only in the number of quarts he can turn in in the course of the day, while the quality and condition is of very little, if any, interest to him. As a result of this, there is more or less unsound fruit in the boxes. Now here is where the trouble begins—this unsound fruit is not only itself unfit to eat, but if not removed, damages the fruit near it so that in the course of four or five days (the time usually taken to get it to the consumer), it often becomes a mass of rot and mold at the other end of the line, practically unsalable and if not, very unsatisfactory, to say the least. Here is a chance for the grower to put himself in the place of the consumer for a moment. Imagine how pleasant it would be to pay from 25 to 50c for a box of what you thought were strawberries, but on examination found to contain largely buttons and rotten ones. I wish to say right here that if the strawberry industry is to continue to extend that the pleasure and satisfaction of the ultimate consumer must be considered.

As to methods employed in shed packing, I will say that our growers at Pierce City usually adopt the piece system. By this I mean that the force of help at the local packing shed is usually divided up into cullers and graders, packers and shed inspector. The larger part of the force cull and grade; say about two-thirds of the force. The other third is divided up into packers, finishers and inspector. In small fields all of this work is sometimes done promiscuously, that is, without reference to these divisions. But when a large force is required, it is much better to divide up and hold each division responsible for its own work. If anything goes wrong then, it is much easier to trace it to its source. In every shed there should be some one as superintendent or foreman, to see that every division does its work properly, and that nothing leaves the shed for shipment that has not received his stamp of approval. In the culling of the berries, those in charge determine by the "size run" and general appearance of the box of berries as to whether it be fancy or No. 1. This grading at the local shed is only approximated and is not stamped with the Association's grade mark. That should be done by the shipping inspector at the association shipping shed. For facilitating the work of packing in the local shed, culling trays or pans have been contrived in the shape of a flat, shallow tin scoop, tapering from eight to ten inches in width at the handle to about four and a half at the other end, and about twelve to fourteen inches long. The object of these trays is to expose the surface of the berries in order to cull out the faulty without necessarily handling the good ones. After picking out the fruit unfit for

shipment, the tray is dumped into the box from which it came, and settled, and fruit added to make it nicely rounded. It is then set aside for the packer, who places it in the crate. The packer, after filling a crate with the culled and graded boxes, fills out the corners of the top layer of boxes and adds berries enough to make the top appear solid with red berries. Women and girls are generally employed to do this work, as they can do it more rapidly and with less danger of injury to the fruit. Tables with oil cloth covers should be placed conveniently about the sheds for the work to be done upon, and the sheds should be built with the delivery window open to the north, so as to avoid the direct rays of the sun entering and damaging the fruit in process of packing. There should be plenty of light, but the drying southwest wind should, in a measure, be excluded. As each crate is finished and stamped, it should be immediately placed in the coolest and darkest part of the shed; preferably on the cool, damp ground, and as soon as a load has been packed they should be loaded and moved directly to the refrigerator car. I have noticed that at many shipping points there is quite a tardiness in getting berries into the cars. This is all important, and should be corrected. Finally, I would say to the growers of Southwest Missouri, raise the standard of quality higher and higher, for seldom or ever will there be more than a sufficiency of honestly packed, strictly fancy strawberries.

INSPECTION OF STRAWBERRIES.

(By John Ledl, Inspector, Pierce City Fruit Growers' Association, Pierce City, Mo.)

Inspection starts with instructing growers how to pick, pack, sort and haul the berries. An inspector has to deal with a good many different men and he cannot please them all and some get mad. If he pleases the growers too well, he does not please the commission man, so when he is in doubt he has to divide the displeasing between grower and commission man.

I soon learn the growers that put up their berries honestly and those who put them up dishonestly. Every grower must have clean boxes, well made with hinges on the lids for the convenience of the inspector of the berries, and for the commission man. The Pierce City Association likes the square box best. I think berries look best in the square boxes. Most growers in Pierce City use a scoop, made especially for the purpose, for sorting berries in the packing shed. Each box of berries is emptied in the scoop and the bad berries are taken out without touching the good ones. Those using scoops bring in nicer berries, and I think all growers will soon use them. It would not be so much trouble for the inspector

if all would use them. Green, knotty, sandy, over-ripe and small berries are rejected. We grow mostly Aroma berries, but some Warfield. Aromas should be riper than the other varieties. The boxes have to be well filled and well packed. The top boxes have to be rounded nicely. Every grower must have same size berries in lower boxes as in upper boxes, or he gets a lower grade or they are rejected. We have Fancy and No. 1 grades. Every new grower that brings his first berries to the shipping is called to the platform to be instructed how to pack and sort his berries.

We have a shipping shed one hundred feet long, and with two rows of tables. One is for the inspection of berries; then after they are inspected, they are set on the other row of tables ready for loading in the car. In rainy weather the berries should be picked right after the rain, while the berries are cool. When a grower brings in bruised or mashed berries I examine his wagon to see how the springs on his wagon are. Some use bolster springs on their farm wagons, but do not use bolsters without standards, so in rainy weather the wagon bed gets tight between the standards and does not spring freely. Then they have mashed berries.

DISCUSSION.

Question.—Do you pick when there is a heavy dew?

R. F. George.—Yes; by picking the strawberries one by one, placing them in the sheds in the light and air before putting them into the crates, they lose that moisture which the dew has given them. I would get out in the morning to pick my berries.

Question.—Do you inspect every crate?

R. F. George.—Not exactly, but we make every effort possible to do so. If the inspector fails to find any irregularity practiced by a grower, we ask the commission men to report failings of this kind. We guarantee our pack. When we began this inspection business we had a man who had a large acreage, who did not pick on Sundays. I have no fault to find with that, but he could not get over his fields on the following Mondays. Now the Committee expected trouble with that man. He had begun selling on track, and several of his cars were shipped to E. B. Stacy & Sons, Indianapolis. In one day he shipped 104 crates of berries; we went to that man on Monday and cautioned him as to what we were going to do. We received a wire saying that 104 crates of berries were damaged to the amount of $50.00. Our President charged this amount to the account of this man. I tell you it worked. He afterwards became one of our best growers.

Pierce City has never had but one association. An association must absolutely control the growers. We try to work together, and we have

not had any trouble in selling our berries. We would have had though, if we had not worked together.

J. B. Graves.—By reason of the good pack that you put up at Pierce City, do you get better prices than the other associations?

R. F. George.—Yes; we get 15 to 25c, and even 35c, more per crate than the other associations. If we all pull together, we will have no trouble in getting the price at home. We never could see anything in this consigning proposition.

J. B. Graves.—Don't it cost 15 cents more to put up such a pack at Pierce City?

R. F. George.—No, not that much—not over 6 to 9 cents per crate more. It depends on the size of your fields and on your system employed. We are looking to the future in this matter; we look to the extension of our business. If we do not do the right thing to the consumer, he will withdraw his patronage. We feel sure we shall be able to sell all the fruit we put up. I think in all lines of business quality is considered a vital point. Those who put out the best grade of stuff are sure to get the trade.

Mr. Richardson.—How many acres can a man handle by your methods.

R. F. George.—About fifteen acres. It all depends upon the man. It does not pay to spread one's energies over a large acreage and employ slipshod methods. I believe, to be entirely successful, you ought to be thoroughly acquainted with the business. There must be system in this work; some lack method and fail.

J. B. Graves.—Can a merchant be a berry grower?

Mr. George.—No; the business must have personal management by a man who knows all about berries.

J. B. Graves.—In doing this kind of work, how many people would you have in the shed when you have 20 pickers in the field?

Mr. George.—They would pick from 80 to 90 crates a day, and you will need four good shed hands.

Mr. Graves.—What do you pay shed help?

Mr. George.—In Pierce City we pay shed help 12½ cents an hour. In some places they pay 10 cents.

J. B. Graves.—If the berry growers are not interested in this inspecting business, I want to tell you that I am. The buyers tell the inspectors that if all the growers would pack their berries as some of us do, he would give 50 cents more on the crate. They are willing to pay 50 cents more on the crate for a first-class pack. Is it worth while for the associations to work for that 50 cents?

HORTICULTURAL INSTITUTE

Held at Parkville, Missouri, Nov. 16, 1910.

THE COMMERCIAL APPLE ORCHARD.

(By J. H. Darche, Parkville, Missouri.)

Faith in the business, founded upon knowledge, is the first requisite for success, but not a blind faith that will take a leap in the dark. That would be a lottery which might draw a prize if all the conditions necessary to success should be met, but would most likely draw a blank, unless the orchardist acquired the knowledge as soon as possible after investing. Now, this knowledge includes all the branches of the business—fruit growing and fruit selling, size of orchard, location, soil, climate, varieties, planting, cultivating, fertilizing, pruning, protecting, picking, packing, delivering, marketing, financing, managing. Suffice it to say that most of the methods of work named may be acquired by reading or other means of information and by experience, after a beginning has been made; but the counting of the cost ought to be the very first thing attended to before rushing into commercial apple orcharding.

The size of the orchard also must be taken into consideration, and limited to the amount that can be properly cared for. The cost ought also to limit the size. It is more profitable to care for a small orchard well, than to have a large orchard and neglect some of the essential requirements. In a large orchard the labor question is quite a problem. How shall one provide help to gather and put away in a few weeks in September and October thousands of bushels of ripe apples, or ship to market or cold storage in time to save from a great loss? It is much better to have twenty or thirty acres of good apple orchard well cared for with only eight to ten per cent of second grade fruit, than to have 100 acres or more neglected or slipped over carelessly with little or no cultivation, and the tops of the trees so dense, like heaps of brush, that red apples, as they ought to be, are only green and spotted by the leaves and subject to fungus attacks, and the fruit gnarled and knotted rather than smooth, round, large and well colored.

Among the most essential requirements of the orchard then are good

cultivation and annual pruning, with systematic spraying in the bearing orchard, and protection from rabbits, mice, borers and other pests in the growing orchard. If the soil is poor and thin, it should be fertilized with barnyard manure, some chemical fertilizer or by clovering or cropping with cowpeas.

Good culture and care are expensive if all the labor has to be hired and paid for. In a twenty-acre orchard a man and his own family can attend to the work necessary for the first ten years probably, with some degree of thoroughness, but when one has 100 or more acres of apples and the trees are of bearing age, there is a demand for much additional help.

Let up suppose the orchard is 100 acres, mostly winter varieties, 12 years old, and having been kept each year in fairly good condition, with the prospect of a good crop. What expense are we to face in the beginning of the season, say March 15, all ready for the first spraying before the buds swell much? From four to six acres per day is about the amount one gang of three can spray, and do it well. In 100 acres it would take about twenty days with one machine to get over the ground once. As that would take too long a time before the blossoms open, we need more than one sprayer. We ought to be able to get over the orchard in one week, which necessitates three sprayers. Gasoline power sprayers and outfits cost about $250.00 each; three would cost $750.00. The material for the season for three sprayings will cost about $150.00, and three teams, if hired at $3.00 per day, and two additional men, $3.00; twenty days, at $6.00 per day, $120.00 for each spraying. If sprayed three times, $360.00 for the expense of putting it on. So the season's bill of expense for spraying a 100-acre orchard three times would cost $1,260.00. We have the machines left, reducing the cost to $510.00. We should also have one more team for cultivation, mowing, etc., for two months—at least fifty days, at $3.00, $150.00.

If we have pruned this orchard on fine days in winter, or early spring, with forty-eight trees to the acre, thirty feet apart each way, 100 acres would have 4,800 trees to be pruned. Do you think it is play to prune into open heads 4,800 trees, twelve years old, if on good ground and cultivated all these years? We must let in the sun and air, which will make fruit in the center of the trees, where before it had mostly all gone to wood growth, and it will be of bright color and large size. We must cut out the interlacing branches, water sprouts or suckers, and all dead wood, and it is best to do this each year while they are small, and not put it off till they are grown large, when the saw must be used, and hence much danger of injuring the trees from the large wounds. Our late friend, Mr. Gano, this last spring pruned out an orchard which he had just bought, sawing off limbs from one to three inches in diameter,

and he used gallons of paint on the cuts made by the saw. But this gave both size and color to the fruit, and they had more bushels of apples of larger size and greater value than if unpruned. If, in an orchard of 4,800 trees, one man can prune thirty trees per day, it would take 160 days' labor to get over the orchard, at $1.50 per day, which would cost $240.00. If pruned regularly each year, it might not cost over $100.00.

Now, all these necessary expenses require a large amount of faith for an orchardist to see any profit after paying such heavy bills. Let us suppose this orchard has an average of two bushels per tree, and we had some trees that had ten to twelve bushels each this year, 4,800 x 2=9,600 bushels. Allow ten per cent for culls, 8,640 bushels from 100 acres, at sixty cents, would be $5,184.00. But by neglect, this orchard would have fifty per cent of culls, or a loss of 3,840 bushels, at fifty cents, equals $1,920.00 for neglect.

Take an illustration from D. Lowmiller's apple orchard of twenty-three acres:

Crop 7,000 bushels, at an average price, after deducting barrels, picking and packing, and delivering to the depot, of 65c	$4,550.00
Cost of cultivating, spraying, mowing, pruning, etc	200.00
	$4,350.00

The twenty-three acres then, amounts to $189.00 per acre with eight per cent culls, and a crop of over six bushels per tree on the average. An instance of the difference between good care and what one of neglect would have been.

We have one difficulty on our bluffs and hillsides, which is the washing of the soil into ditches and gullies. We have sown clover, and where we get a good stand it is a great help, but it is difficult to get a full catch so as to hold all the soil, and it is necessary to mow weeds and grass and fill in the ditches in spots to act as dams in catching and holding the dirt during rains. The washing off of the surface soil impoverishes the ground and dwarfs the growth of the trees, and makes the fruit small and worthless. So these hillsides need renewal with fertilizers, manure, etc.

A very important matter is the choice of varieties. If the location is near a city, some summer and fall apples can be planted to advantage, but usually the commercial orchard is planted with winter varieties, so as to be able to hold them for a time, if necessary, or for cold storage for winter sales. The varieties we prefer in the vicinity of Kansas City are for July apples, Early Harvest, Red June and Red Astrachan. For August, Maiden Blush, Lowell and Wealthy. For September, Jonathan,

Grimes Golden and Fameuse. For October, York Imperial, Gano, Ben Davis, Mammoth Black Twig, Winesap and Ingram. Our most profitable apple is the Jonathan; a fine bearer of large size, beautiful color and the richest flavor, always selling at the highest prices. The York Imperial is also a first-class apple of large size and a great bearer. The Gano comes next as a full bearer with brightest red color and large size. The Black Twig is a noble apple and a great grower, but the bearing qualities have not been fully tested, and will not be until the trees get older, and then they may yield heavier. The Ben Davis is the old standby for crops of large red apples, but will not sell as high by a dollar a barrel as Jonathan and Grimes. The last is a light-yellow apple of the richest quality, and a good bearer, but needs picking promptly when ripe, for it is a great apple to drop off the trees. The Winesap is a first-class apple, smaller in size, but yet sells well.

In planting a commercial orchard, be sure to keep varieties together, and not mixed up in the row, and not too many kinds of apples, and the orchardist will have more comfort and satisfaction when the crops come in.

GROWING MARKET GRAPES.

(By Gerald Holsinger Rosedale, Kansas.)

Many farmers believe that the mule is a more economical animal for farm use than the horse, and a few of these farmers, knowing that a mule will eat less, or rather will do the work with less feed than the horse and keep in fair condition, pasture the aforesaid mule in a lot where a haystack is visible, allow him to curry himself on a pile of corn cobs, and work him overtime because it is understood that he is only a mule.

In fruit culture, the grape is the mule. This fruit will live under conditions that other kinds would not stand; it survives where other kinds would perish; it produces a fair quantity of fruit where other things would fail; and for these reasons the grape is probably more neglected than any of the other fruits.

In my list of acquaintances in the fruit business there are, I think, about three who really think anything about grape culture. They really think when they are planting, cultivating, pruning, training, etc., but they do not have much company. Others plant and prune, just as a boy carries in the wood for the night; to get through.

How many of you have studied the different varieties to see how much wood they will carry to the best advantage? If you have two rows side by side, how much difference do you make in the number of

fruit buds you leave? How much difference is there in the number of fruit buds to the yard of average wood in Moore's Early and Moore's Diamond?

As an example, there are many grape growers in Wyandotte county, and a number of them ordered Campbell's Early a few years ago, having seen the wonderful success of one man who had a few. Two years ago, I tried to get some wood from them for cuttings. Over one-half had already cut out their vines and the other half were ready to do so, with the exception of three. These three were enthusiastic over this variety. I first thought that it was a grape that would succeed only under the most favorable circumstances. Naturally, I was interested, and began asking questions. Those who succeeded were a unit in saying that they did not leave but about one-half the wood that they left on Concord. However, they not only got a fancy price for their fruit, but they got in pounds more than on any other variety.

Without preamble, I will take up the different phases of grape culture and give you my opinion. If my conclusions are correct and you care to follow my methods, my advice will cost nothing, and if, after thinking it over, you decide that you wish to follow some other method, you may cut my fee in two.

A plan is first necessary. Will you plant with the idea of pruning by the fan system, drooping or Kniffen system, or some other plan? I prefer the fan system; that is, to make the trunk grow almost to the lower wire and the fruit wood from this point and spread out fan-like in tying to the wires. The height of the trunk should vary with the variety as the wires should generally be uniform, and by growing the varieties that do not carry so much wood higher, the top wire may be reached with fewer fruit buds. Distance should be eight feet each way, though if you have not much ground, they may be planted successfully and get good results by planting seven feet each way.

Age of Plants.—In Kansas, standpatters are not very popular at present, but in this particular I am an 18-carat standpatter. I would not plant anything but a one-year plant. I had rather plant what is commercially called a 1-year No. 2 than a 2-year No. 1. But my idea of the best plant is a 1-year No. 1. It is cheaper than a 2-year old and will respond more quickly. A large proportion of the grapes that are sold as 2-year No. 1, are 1-year culls, which were too light for the retail trade at 1 year and were lined out and cultivated another season. For the retail trade they are fine plants, as they make a good show, where the 1-year plants look light. In the retail trade the largest we have is always a little too small for the person who wants a half dozen for the backyard

or for a trellis, but if we could get them to take the smaller plants, they would get better results.

Varieties.—Our western market wants blue grapes. Champion for extra early for the large markets has been the best money maker. However, it is not of good quality, being very acid. Campbell's Early, Moore's Early and Concord, in the order mentioned, are the best for market. Worden is the best for local market and home use. A few white varieties, such as Niagara, Pocklington and Diamond, are in demand. Woodruff Red and Wyoming Red are also very salable. Eighty per cent blue and ten per cent each of red and white sorts are about the proportions that the Kansas City market calls for. This varies with the market and with the year as well. A few years ago, Woodruff Red brought a fancy price, and many were planted. Now they are a drug on the market. Niagara often is in demand, but the past year there was not so much call for them. It is well to have some of each, however, as you can generally dispose of some with the other sorts.

Planting.—Mark off the ground with a stirring plow both ways at the distances decided upon—seven or eight feet. This will generally leave the soil mellow at the intersections, so that the plants can be set easily. Be careful to get the rows straight, for when the plants are not in alignment both ways, the first year's cultivation is apt to scar the plants occasionally. The plants should be set straight, particularly in the direction in which the posts are to be set, for unless the row is straight, the plant will be out of line or the post will be out. If the post is out of line the pull of the wire will draw it over more or less and your wire will sag; or if the post is straight and the row crooked, in cultivating, you will be tearing out the roots and bruising the plants. Prune each plant, root and branch before planting. I would cut the roots on each plant to six inches or less, and the top to two eyes. My idea in pruning the roots is to make the planting easier and to make it take root more quickly. Did you ever notice in dipping a transplanted tree that the plant or tree always sends out its rootlets first at the cut? Then again, in digging the vines at the nursery, the digger frequently tears the roots off and does not cut charply. A root that is two inches long, cut sharp, is worth more than one a foot long that is haggled or bruised and torn off.

After the plant is pruned and the ground marked off, it is well worth the time spent to stake each intersection to get the plant in exactly the right place—that is, straight in the row. Set the plant in its place, covering about one-half the proper depth by hand, and tramp well. This will be enough to prevent drying out. Then follow with a diamond plow and finish in this manner. You can easily see that I do not like work.

Begin the cultivation about 7:10 the next morning. This allows 10

minutes to get into the field. Use a five or fourteen tooth cultivator and follow as often as is needed to keep the ground mellow. No one can say in numbers how often this should be done, but the soil should never be allowed to remain with a crust on it. If the plant starts early and makes a good growth, pinch back at about two feet and start your main stem at about that height.

Pruning.—After the main trunk is established, do not pick out the extra large or the small canes for your fruit wood. The large ones have their eyes too far apart and will not be as profitable as those medium in size. You must learn your varieties and leave the wood as the plant can ripen the fruit. Large bunches count up in weight more quickly than small ones, and sell more quickly and at a better price. I like to get all the fruiting wood left up to the upper wire. This allows a good distribution of the fruit and gives a good opportunity to see everything. As the new wood grows, summer prune as the plant requires. This throws more substance into the fruit and allows better air circulation, and in spraying, also gives a better opportunity to reach the fruit and wood. I would not advise thinning out in summer to just what you will require the next season. If the growth is not heavy, a very little summer pruning may be required or is advisable.

BRIEF REVIEW OF ALL-THE-YEAR-ROUND MANAGEMENT OF THE APPLE ORCHARD.

(By Daniel Lowmiller, Parkville, Mo.)

Successful management of the apple orchard dates beyond one year's work. The foundation stone of the lives of many of our great men were laid in boyhood days. The same is true of a good work horse. He should be handled properly from the time he is a colt. Would not the same be true of an apple orchard, if it be managed prudently, not only one year, but for the full lifetime of the orchard?

Begin with the selection of varieties, the planting of same on a proper location where the soil and subsoil are of the right character; good treatment while growing to maturity; and with a foundation of this kind, you may expect good results. But remember, the work has just begun.

We will take it for granted the orchard is now ready for bearing, and with proper care from one year to another, by pruning, cultivating, spraying and thinning of crop when necessary, we will be well rewarded for labor expended.

This year's good results from my orchard I owe, not only to this

year's work, but to former years as well. Thus you see one year's work follows another.

To show you that orcharding will pay in the State of Missouri, I want to give you a few items from our own county. This fall we shipped from three stations in Platte county, Weston, Iatan and Parkville, 445 carloads of apples. Counting 165 barrels to each car, would make us a total of 73,425 barrels, or $146,850.00; quite a tidy little sum for such a small acreage of apples as we have in Platte county.

Why go to Washington, Oregon and other parts of the northwest for fancy apples when the State of Missouri could be made the banner state?

The soil and location along the Missouri river hills from Jefferson City as far north as St. Joseph, cannot be beaten anywhere; besides this, there are plenty of other good locations in the State.

Our fruits have better flavor than any of the Western fruits, and with the same care and attention, the Northwestern orchardists give, I believe we can beat them.

Our brother orchardists of the Northwest are skinning us every day in prices. Why? Simply because they take pride in caring for their trees by keeping them in a healthy condition. Only perfect apples are allowed to mature, so at picking time about all they have to do is to grade and pack their fruit, which they do in a systematic way.

This proves my theory that one year's care of an orchard is nothing, unless it has always been properly cared for.

THE FUTURE OF MISSOURI FRUIT GROWING.

(By W. L. Howard, Sec. State Board of Horticulture, Columbia, Mo.)

The future of the fruit industry of Missouri and the Middle West depends upon the attitude of the individual grower toward that business. Whether he is willing to give the business his intelligent attention or not is going to determine whether we shall maintain our position and live up to our possibilities. We hear a great deal about the profession of fruit growing in certain famous regions of this country, notably in the West and far Northwest. Are we able to accomplish similar results? Most of us believe we can. Now, we, of course, have the advantage over those people in the west in that we are near our markets, but we have not begun to live up to our possibilities. Those far-away people must depend largely upon the east for their market. They cannot afford to ship anything but high-class fruit such long distances. We here can compete with them even where high-class fruit is sold, and at the same time we can find a market for our low-priced fruit. How can we compete with them?

By the better management of our trees. We must do all of the things that they are doing. We must learn to spray, learn to prune and learn the value of healthy foliage on our trees. We must learn that the good effects of spraying are not limited to one season only, that is, to the season when applied. The effects of spraying are cumulative; that is, what we do this year will help the next and the next, and if we repeat these precautions, we have the accumulated effects which are capable of producing a crop annually. Our trees do not produce often enough. For a time we thought that they were incapable of producing every year. Our friend, the Ingram apple, because of its habit of late blooming, escapes the late spring frosts which so often kill the other varieties. But we must do our share. Whether our fruit business is going to be profitable or not depends upon our attitude toward that business. It has been developed here today that there is danger enough, even when we do our share. The danger I have reference to lies in the proximity of orchards, the owners of which have not done their share. You have seen today, though, that we cannot afford to refuse to spray or cultivate our orchards even though a neighbor, just on the other side of the fence perhaps, will not do a thing and lets his orchard run wild. But that is not the whole story. It is the kind of fruit that we produce and place upon the market that is going to be the biggest question, it seems to me. We want to produce fruit that will successfully compete with the best in the leading markets of the country. This means that we must produce a fancy grade. However, it is probable that we shall continue to produce some second grade fruit and even third grade fruit, and if the growers of these grades are satisfied with the markets that they can find for what they have to offer, they can undoubtedly dispose of everything they grow. Here is where we have the advantage of the growers in the far west—we are a thousand miles nearer market and can afford to ship fruit that is not of first quality. This they cannot do profitably, and so they go after the fancy trade. But to produce anything but the lower grades, we must get into the habit of spraying, pruning and cultivating. The trouble is that too many of our growers do not seem to know that they are not living up to their possibilities, while others believe that they are handicapped in their endeavors to attain to better things. Under present conditions, the people of the State and without the State, are asking why we do not get some legislation to enable us to live up to our possibilities.

It is a well known fact that neglected orchards are a menace to the community. We are facing a big question in Missouri where there are more apple orchards by far than in any other state in the Union. Moreover, we know that thousands of the smaller orchards of this State are

owned by farmers who are more or less ignorant of the value and necessity for spraying. People ought to be compelled to spray their orchards where it is found that there is danger of spreading some dangerous disease or insect. There are a few insects and diseases which must be given immediate and thorough attention if they are to be held in check, while many of the other more common ones spread only very gradually. The dangerous ones must be reached quickly, even if force must be used, while the others may be reached by means of education, persuasion and, finally, in extreme cases perhaps, by force, when all other means have failed. A campaign of education should be carried on to teach the fruit growers how to spray, and how to care for their trees, and when they will not, then they should be forced to do so. In the far West and Northwest there are strict laws regarding the spraying of orchards and inspection of nurseries. Also, the big fruit growers' associations in those states have rules of their own which compel the fruit growers to keep their orchards clean, and they will not allow any man to pack for shipment fruit of any kind which is infested with insects or diseases. Fair-minded men are asking why we in Missouri cannot extend just such protection. East, west, north and south, there are regulations which protect the grower from nursery stock that may be infected. I can go out and grow fruit trees and they can be alive with San Jose scale and they can have all sorts of diseases and insects on them and I can sell them to you if you are of a mind to buy them. There is no law to prevent me from selling any kind of unclean nursery stock in Missouri. However, to the credit of the nurseries of the State, they are careful to keep their stock clean. This is especially true of the larger concerns. In some instances, small dealers, through ignorance, have allowed San Jose scale to get a good foothold. The State Board of Horticulture inspected the nurseries last year. This year, we have an entomologist at the University, and he will inspect the nurseries. While Missouri has no law requiring the inspection of nurseries, most of them are annually inspected, chiefly because they want to ship their trees into other states where they have laws requiring each and every shipment to be accompanied by a certificate showing that the nursery has been inspected.

The State Board of Horticulture has prepared a bill which will provide for the annual inspection of nurseries, and the inspection of orchards, etc., at any and all times when it may be necessary or the owners may desire. A State inspector would soon become a public necessity and would speedily educate the people to know the bad diseases and insects and what to do for them. This ought to enable us to live up to our opportunities and possibilities.

Note.—While the bill providing for a State Horticultural Inspector

failed of passage because of early adjournment of the Legislature, a generous appropriation was made, which will enable the Board of Horticulture to co-operate with the University and take charge of the nursery inspection work and also carry on spraying demonstrations throughout the State.

NURSERY AND ORCHARD INSPECTION.

Following Dr. Howard's talk, Mr. Lowmiller, Mr. Darche and others discussed the advisability of securing legislation which would provide for a traveling inspector who would inspect orchards as well as nurseries and teach the people how to spray. It was the opinion of all that the inspector ought to have the power to compel the owners of orchards to spray their trees, in certain cases, whether they wanted to or not.

Mr. Hitt stated that the Board of Horticulture had drawn up a bill providing for these things, and the next speaker asked that it be read. Mr. Howard summarized the important points covered by the bill in a brief talk.

The temporary chairman of the meeting, Mr. L. A. Goodman, then asked Mr. Howard if he had a resolution with reference to what had just been read. Mr. Howard replied that he had not prepared anything, but that he had a copy of the resolution read the day before at the Strawberry Congress at Neosho, which might be slightly modified to cover the present case. At the request of Chairman Goodman, Mr. Howard then read and moved the adoption of the following resolution:

Resolved, That it is the sense of the fruit growers of Parkville and vicinity that the proposed bill providing for the inspection of nurseries and orchards of the State, as described in Mr. Howard's outline, be approved; and, be it further

Resolved, That we second the efforts of the Missouri State Board of Horticulture in trying to get the said bill enacted into law by urging its favorable consideration by the members of the Forty-sixth General Assembly of Missouri.

Unanimously adopted.

HORTICULTURAL INSTITUTE

Held at St. Joseph, Mo., December 9, 10, 1910,

IN CO-OPERATION WITH THE

St. Joseph Horticultural Society and the Fruit Grower.

ADDRESS OF WELCOME.

(By H. G. Krake, President of St. Joseph Ad. Club.)

In offering a word of welcome to the Missouri State Board of Horticulture, the St. Joseph Horticultural Society and the Fruit Grower, I want first of all to state that the city of St. Joseph and the Ad. Club of St. Joseph are honored by the selection of this city and the headquarters of this club as the 1910 meeting place of the Horticultural Institute. That we appreciate the compliment conferred upon us we shall endeavor to show by our attendance and our interest, and by other evidences of co-operation in making this meeting a satisfactory one in every respect.

Not only are we glad to have this exhibit and meeting as a means for attracting to our city many visitors from the neighboring communities, but more especially are we pleased to have it by reason of the educational features of the movement which are brought directly home to our people. If, as a result of this gathering, our people are inspired to higher efforts for better culture, and the adoption of more improved methods of caring for and marketing their fruits, much good will follow; and if by better treatment we shall succeed in producing two apples where heretofore one has grown, or in producing one good apple where in the past a poor one was gotten, then indeed will great good be accomplished in the development of the horticultural resources of this and surrounding communities.

Perhaps no more striking example of the want of improvement in our horticultural practices need be referred to than was witnessed in our local apple market during the season just closed. Throughout the marketing season there was keen demand, at high prices, for sound and carefully picked fruit, while that of inferior quality went begging for purchasers at any price; and I know of instances of the low grade fruit being refused as gifts, the supply of that class of fruits running so greatly in excess of what could be absorbed by those to whom it was tendered without price.

That sound fruits, of high color and delicious flavor, can be grown here, has been proven beyond question by those who have given to that industry the proper care, and any movement, therefore, is most commendable which may tend to fire our people with renewed ambition for producing the best qualities, as well as the largest quantities, of which our climate and soils are capable.

We wish for this meeting complete success, and hope that it may be but the forerunner of other and larger meetings in our midst.

The Ad. Club will always be found with open arms ready to receive you, and ready to extend whatever assistance it can in the advancement of the splendid work.

RESPONSE BY R. M. HITT.

Ladies and Gentlemen—Fruit growers always get a better welcome than anybody else. I don't know whether this is for their own sake or on account of what they produce, but I have an idea it is both. Horticulture is, in the State of Missouri, entering upon a new life. I can feel it in all the meetings I have attended recently, I can feel it in the papers that are read at these meetings, I can feel it in talking to the fruit men all over the State. We cannot get away from the fact that Missouri is the best fruit State in the Union, and it is up to the fruit man to prove that fact to the entire country. The question with the grower now is, not so much quantity, but quality. It is necessary for us to compete with other countries, and I believe Missouri is in a position to do so. I have seen it demonstrated in the last year, that with proper care we can produce fruit equal to any other section, and I have contended that in one respect Missouri leads over all others, and that is in the production of strawberries; not only in quantity, but quality.

The State Board of Horticulture held a Strawberry Congress at Neosho, Missouri last month. The meeting was well attended and a great interest shown. The main point up for discussion at this meeting was. "How can we grow better berries" and "more berries to the acre?" This can be done if the ground is in satisfactory condition and systematic methods are used. These are employed in other sections and should be applied right here in Missouri. Mr. Turner told me yesterday of some gentleman living near St. Joseph who shipped 4,000 bushels of apples from nine acres. Now, if one man can do that we can all do it. If we would study our conditions at home and improve our methods by profiting by results obtained elsewhere, we can compete with any of them.

I look for great things along horticultural lines for Missouri. I do

not believe that Missouri has seen her best days in horticulture by any means. She is just beginning, and as I said before, the interest taken by the fruit men all over the State now is to produce better apples, as well as more apples. In the section of the State where I live, for several years everybody was trying to see how many peach trees they could set out, and each one seemed to be anxious to see who could have the most acres. In the last year these people have been cutting their orchards into a smaller number of acres. I do not believe in small acreages for everybody, for a man can have just as many acres as he has capital and ability to take care of, but the fault with the most of us is, we over-estimate our capital and our ability. For most of us what is wanted is a smaller acreage and better results, and it is meetings of this kind that help us to secure these results and keep Missouri in the front line, horticulturally.

I hope the Board of Horticulture will be able in future years to hold many institutes annually in all parts of the State. Let us all enter into the discussions at this meeting and make it unusually instructive and long to be remembered.

SOD VS. CULTIVATION FOR THE ORCHARD.

(By Jno. F. Wilcox.)

This question has been thrashed over and over, but it will not down. Just about the time we decide which we think is best, conditions change and we are at sea again, and the hobby has gone glimmering.

There cannot be any hard or fast rule that will decide this question. We think cultivation for the first few years of a young orchard is best, and probably longer in some cases. When orchards are planted on thin land, land that will not support more growth than the trees require, cultivation is probably best, but when the land is reasonably strong, I do not consider cultivation necessary or indeed advisable.

When an orchard is producing a growth of six to ten inches on tips of limbs, the trees are receiving all the nourishment neeessary for a crop of apples, and are in a better condition to bear than if making too much growth. Therefore, one must be governed by the conditions of his trees rather than by theory.

I think clover preferable as a fertilizer, but clover does not long survive in an orchard, but gives way to blue grass. But this is not particularly objectionable. The clover will produce more plant food than blue grass, but it has the fault of drying out the ground more than many other crops and does not make near so good a carpet as does the blue grass. Neither will the clover restrain the growth of weeds as well as blue grass.

About all that can be claimed for cultivation is the stimulation of growth, while it has several disadvantages. Many orchards in cultivation are seriously impoverished by being badly washed by heavy rains. Cultivation leaves the ground in an exposed condition at gathering time. At that time there should be much moisture. Again, I am of the opinion that fruit in cultivated orchards is more likely to be infected with fungus than orchards in sod. As to cultivation for the destruction of insects, this theory has been superseded by the facts that orchards that have been cultivated are producing as many insects as those in sod.

DISCUSSION.

I. Y. Elliott.—I was forcibly struck with Mr. Hitt's statement about our being able to produce two apples where only one grew before, and what we are going to do with those extra apples after we grow them. Some time ago I met a man by the name of Sheppard, who publishes a splendid fruit paper in the far west. I believe it is called "Better Fruit," but I do not mean to say that it is better than the "Fruit Grower," published by our friend, Irvine, right here at St. Joseph, which I think is the best fruit paper published in the United States. At the time this man Sheppard began the publication of his paper, he was manager of a fruit growers' association at Hood River, Oregon. Through his paper he stirred up a sentiment among the people there that caused them to adopt correct methods of planting their fruit. Now, they don't grow better fruit than we do, but they certainly do pack it better. They ship only their extra fancies. They have learned that Uncle Jim Hill charges just as much for shipping our cheap stuff as he does the very best, and we all know that the profit is better on good fruit than it is on the lower grades. Out there, they thin their orchards, and I believe we should adopt their methods in our own orchards. Pruning, I believe to be the most essential. You can't raise good apples in an orchard where there is four times as much wood as there should be. I don't believe there is an orchard in this part of the country but has too much wood in it. In both Oregon and Washington, they cut out about two-thirds of the wood from their trees. After visiting some of the orchards out there, particularly at Hood River, I would be ashamed to have them come into my own orchard. Speaking more directly on the subject of the paper just read, I will say that there are some orchards that can't be cultivated. However, we should cultivate wherever we can. The freight on inferior apples is just as great as on the better grades. In most instances, we can't have good clean fruit without cultivation, so I think we should cultivate wherever it is possible to do so.

W. P. Stark.—At one of our State meetings several years ago, our good friend and fellow fruit grower, Brother Todd, asked me if I would not prepare a paper on Orchard Cover Crops, which I did. Now, in addition to clover, I think one of the ideal treatments of the orchard would be to use cowpeas for many Missouri soils. I should also mention the Hairy Vetch for spring sowing. Mr. Todd made a trip to the far west to make an investigation of the methods of orchard management. Those people out there have much to learn from the central west in regard to retaining the fertility of their orchard soils. With their intense methods of cultivation, the humus is being burned out of their soils. Humus, as we know, carries a great deal of fertility, and if it is lost, must be replaced by something else that will produce a good growth of fruit. From some of their old orchards, they are now sending Jonathans to market that are not much larger than crab apples. While they have been up to date in practising new agricultural methods, on this one point of cover crops and maintaining soil fertility, they can learn something from the central west. In the far north, the Canadian peas are the best crop.

Mr. Squires.—I am in favor of clean cultivation for the orchard. In the St. Joseph district the soil is rich enough to stand clean cultivation every year up until the last of June, cultivate with the disc harrow six times before this date.

Prof. Whitten.—The object of tillage is to cause the decomposition of all vegetable or organic matter that may be upon or in the ground. Long continued tillage burns out all of this organic matter, which usually consists of more or less decayed vegetation. This makes it necessary to alternate tillage and sod management. Therefore, no rule can be laid down, which will fit all orchards.

THE 1910 APPLE CROP.

(By J. M. Irvine, Editor *The Fruit Grower*, St. Joseph, Mo.)

In 1896 the United State produced sixty-nine million barrels of apples. In 1909 less than twenty-three million, and in 1910 the crop was even smaller. These figures show a great reduction in the production of apples, and instead of there being a violent fluctuation from year to year, there has been a steady tendency downward from 1896 to the present time. This statement is made at the outset of my talk to allay the fears of those who have felt there is likely to be an overproduction of apples.

During the last few years we have heard much about the young orchards being planted in the west and northwest and many persons have feared that when these orchards come into bearing, the apples cannot be

sold. It would seem from the production of apples that the outlook is very encouraging. These western orchards are small in size, and the total area planted is not large. If the orchardists of the eastern states lived up to their opportunities, a single county in New York could ship more fruit in a season than the entire state of Washington.

In the year 1909 the district around Grand Junction, Colorado, alone shipped more apples than the entire states of Washington and Oregon put together. What is responsible for the decline in the production of apples throughout the United States, and what is the lesson for the fruit growers of the present generation? I believe that the production of apples has declined simply because the men who owned the orchards did not adapt themselves to changed conditions. We are now at the end of the first generation of the commercial orchardists in the State of Missouri. Forty or fifty years ago orchards were planted on a small scale—fruit grew without any care, and was of high quality. It sold at prices which brought splendid returns to the men owning the orchards. These men had not given their trees any special care, insects and fungus diseases were not numerous and nature took care of the trees and fruit. The owner simply harvested and disposed of the crops.

Apple growing looked so easy that an era of planting set in and orchards of large size were planted by men who gave no thought of the care which the trees would require nor did they consider what they would do with the fruit after it was grown. As apple trees became more numerous, the enemies to which the trees and fruit are subject, increased, until the methods which were successful with the first orchards failed absolutely with the large orchards which were planted indiscriminately. All throughout Missouri and other states of the middle west, orchards are being cut down simply because the men owning them cannot adapt themselves to the new conditions. They look upon spraying and pruning as expenses which cannot be borne when, as a matter of fact, the proper care of trees should not be regarded as needless expense any more than the plowing of corn or the feeding of hogs.

While I do not believe that there is likely to be an overproduction of good apples in the near future, I do believe that prices for apples will run lower than they have been during the last few years. Apples have been too high in price for the average person to use any great quantity, but when prices reach a lower level so that the multitudes can buy apples, the consumption can be multiplied four times. We have come to the point in the handling of most orchards where we must change our methods. The large acreage must be reduced so that proper care can be given the trees. More pruning must be done and every man who wants to grow good fruit must arrange to spray his trees. That right methods

will bring profitable returns cannot be doubted, for it can be demonstrated by the experience of dozens of men who are handling their orchards along right lines. The orchard business in our State is now undergoing a great change. Many men will cut down their trees or will sell their orchards or lease them to other men who will give them the care they require. I believe this change is for the better, and that the orchard industry will be put on a firm basis.

That good fruit can be grown here has been demonstrated the past season. The apple crop of Missouri was very uneven for 1910. The best crop in the State was harvested in the territory immediately adjacent to St. Joseph. North of this city for fifty miles the crop was a good one, but above that point there was little fruit. To show the importance of the orchard industry in the territory tributary to St. Joseph, I may say that the Burlington railroad alone hauled out of what is commonly called St. Joseph territory, embracing a district fifty miles north of the city and about fifty miles south, 2,880 car loads of apples. This does not include shipments over other lines. Large as this total is, I believe it could have been greatly increased if all of our growers had used practical up-to-date methods.

Another thing which our growers need to study is the marketing of their crop. As a rule our growers have no well defined idea of what they are going to do with their fruit after it is grown, but wait for the buyers to come along and are almost forced to take whatever is offered for their apples. I believe that every grower should consider before planting an orchard how many acres he can care for and how large a crop he can harvest and pack. The size of the orchard planted will depend upon his ability along these lines. Then every grower should arrange to pack his own fruit if need be, and he will have a longer time in which to dispose of his apples. There is no reason why strong associations should not be formed among our growers just as they have been formed in the west. With an association of this kind, the buyers deal with one person in buying apples, and there is not the opportunity to play one grower against another in an effort to beat down prices.

With the adoption of improved methods of pruning, spraying and cultivation, there will also come the adoption of improved methods of marketing, and when this is done, the apple growers of Missouri will find they have entered upon the most prosperous period of their experience in growing apples.

DISCUSSION.

R. M. Hitt.—After all, the same intelligence and business training are required for selling fruit that would be necessary in successful mer-

chandising. Fundamentally there is no difference between the sale of fruit and the sale of goods of any other kind. We need experts to sell our fruit crops just the same as thoroughly trained men are maintained for the purpose of selling the output of a shoe factory. All along, we have been striving to make two apples grow where only one grew before, but we have not been taught what to do with the extra yields after we get them. The weak point in fruit growing just now in Missouri is on the selling side of the business.

Prof. C. H. Dutcher.—I should like to ask Mr. Irvine and the fruit growers present what was the average price of apples per barrel that were sold from the St. Joseph district this past season.

A Member.—I think the average price was about $2.50 per barrel.

Professor Dutcher.—Then it requires only a little figuring to show that the value of the apple crop here during the past season, I mean, that part which was actually shipped out, amounted to $2,400,000. This is certainly a good showing for one single district in an off year. With better methods of orchard management and better methods of packing, undoubtedly far more fruit, and certainly better fruit would have been marketed from this part of the country.

K. B. Wilkerson.—As a buyer of apples, I would prefer to buy fruit from associations. I have to waste too much time in hunting up individual growers.

SELECTING THE TREES AND PLANTING AN APPLE ORCHARD.

(By C. G. Ferguson, St. Joseph, Mo.)

In my experience in planting and growing any kind of an orchard, I always give special attention to the selection of the trees. In the planting of an apple orchard, the first consideration is that of preparation of the ground. Too often people make no provision for planting the trees until after they have arrived from the nursery. The first experience I had along this line was in going from one farm to another selling nursery stock. The preparation of the land should begin one or two years in advance of the planting. In this way such crops may be grown as will leave the land in the best condition for receiving the trees.

Next we select the trees, and we have a choice between trees that are one year, two years and three years old; also, large and small trees of the different ages. Most people understand that a tree of a given age will represent several different grades. People are now planting one year-old trees, whereas twenty-five years ago they wanted them three years old. My judgment is that the one year trees are the best. By buying one year

old trees, a man can form any kind of head that he likes. It is not so easy to trim the branches of an older tree and make it grow exactly as we want it to. In buying two and three year old trees, you may get trees that are low-headed, or you may get high-headed ones. In the West and far West we find that they are now buying the younger trees almost altogether, and trimming them to suit themselves.

Of course, we nurserymen and agents always keep the large three year-old trees in stock, as we often have calls for these larger sizes. Large trees are not so easily harmed by stock during the first year after planting. Some farmers insist on turning their stock in the orchards just after trees are planted. This is not advisable, but is often done, and large trees will survive under these conditions better than small ones.

Varieties.—The proper variety to plant is a question of the utmost importance in all cases. As a rule, too many varieties are planted. Nurserymen may be to blame for this. In order to make a good showing in their catalogues, many nurserymen list from one hundred and fifty to one hundred and seventy-five varieties of apples. We often get catalogues with this many varieties advertised and perhaps the same week others will be received that list only fifty to seventy-five varieties. Sometimes a grower wants to plant everything that he has ever heard of. In fact, it is a common occurrence for a nurseryman to receive an order for twenty-five apple trees representing twenty-five varieties. Of course, this is not done by those growers who have taken the trouble to post themselves.

One of the large nursery firms in the state of New York reports that it sold last spring one hundred and sixteen varieties of apple trees, and out of that one hundred and sixteen varieties, forty-four per cent represented seven varieties. The names of these seven leading varieties which constituted almost one-half of the trees sold during the season by this firm were: Baldwin, Jonathan, Grimes Golden, York, Wealthy, Ben Davis or Gano, and Staman Winesap. I believe if I were to mention seven varieties for this section of the country I would name Jonathan, Grimes Golden, York, Gano, Wealthy, Ben Davis and Staman Winesap. Of course, it is understood when planting a family orchard, that more varieties may be planted than would be permissible in a commercial orchard. The list I have given you is for commercial purposes.

In planting an orchard I should recommend the planting of say about five rows of one variety and then a few rows of another, and so on throughout the orchard. This is for the purpose of better pollination. Of course, many do not believe in this cross pollination of apples, but if there is anything in it, we get the benefit if the orchard is planted as suggested, and if not, we have not lost anything.

If I were starting out to plant an orchard, I should prefer to plant it

where apple growing would be a success. On this account I should want to plant in a neighborhood where there were other orchards. This makes better selling facilities. I think the time has come when apple growers should form combinations of some kind for marketing purposes. We fruit growers should not get the small end of the deal all the time. We can't afford it. It is not right for us to have to pay $6.00 per barrel for Jonathans here in St. Joseph, for example, when we know that these same apples were sold by growers for from $2.00 to $3.00 per barrel early in the season. This does not look right for the growers to get such a small part of the money which the consumer pays for the fruit. Co-operation for selling purposes is the best remedy for this state of affairs.

DISCUSSION.

Prof. Dutcher.—Does Grimes Golden die at the collar, and is the Wealthy a long-lived tree?

Mr. Maxwell.—The Wealthy is one of the best bearers we have, and is a long-lived tree. The Grimes Golden is also a long-lived tree.

Mr. Stark.—Answering Mr. Dutcher's question on Grimes Golden, it requires double working on Spy to make them long-lived. The Wealthy is really not a long-lived tree, but it is an abundant bearer. I have seen Wealthy orchards in Michigan loaded to the ground, and the fruit sold at from $2.00 to $2.50 per bushel. The Wealthy is occasionally a light bearer.

Prof. Dutcher.—Is the Delicious a good bearer near St. Joseph?

Mrs. Cox.—Yes, the Delicious bears well here. The fruit is lighter in color than in the west.

Prof. Dutcher.—Near Lexington the Delicious has a slightly different shape from what it has in the west. However, they are of very good quality.

Mrs. Cox.—With us the Delicious has been a very fine bearer.

MARKETING THE APPLE CROP.

(By Joe H. Murray, Oregon, Mo.)

As I have never had much experience in either speaking or writing on one certain subject, I will, no doubt, do some wandering and stumbling around, but if I get in the ditch, some kind brother I know will pull me out.

When winter loosens her grasp on nature and the resurrection of spring breaks forth, we apple growers watch with interest the coming

forth of the buds. Even the previous fall we have noticed the dropping of the leaves and wondered how strong the buds would be, how much power they would have to resist the frost and the cloudy, rainy weather at blooming time. For to our sorrow we have certainly had a great deal of this kind of weather of recent years.

What a beautiful sight is the orchard when covered with bloom, and certainly we fruit growers enjoy it and the hope it shapes for harvest time.

We spend our time and money and tax our brains to the utmost, endeavoring to care for the orchard properly. I mean we should, but sometimes we don't, you know.

A few years ago this was about all that was necessary, for then there were plenty of hungry apple buyers from a distance, generally from the east, who were willing and anxious to buy the apples as they hung on the trees and do the marketing with hired help, thus relieving the fruit grower of all care and expense. These were years of prosperity for the apple grower. The creeks went dry and it did not rain all the time at the blooming period, the sun shone bright from early morn till dark.

Grover Cleveland was President, and Coxie's army on the road to Washington. There were plenty of empty dinner pails, and an abundance of good men and boys wanting work at from seventy-five cents to one dollar per day, willing to give a good honest day's labor. But of late years things have changed. Our creeks and branches run the year round. Sometimes we have snow and ice and rain and sleet and you scarcely see Old Sol during the blooming period, and if we escape and our apple crop is safe, indeed we feel quite lucky and highly favored, and all goes well till the time of harvest. Then when we go out on the streets and along the by-ways in search for laborers, we find a few "Old Crips" and some women and girls and boys, and some traveling men (the kind that travel in box cars). These people will help for perhaps $2.00 per day and will put in as few hours as possible for them to hold their job. Under these conditions is it any wonder that the apple buyer wants to buy the apples packed? If a buyer has the grit and courage to buy an orchard before it is packed, he must buy it at a low price so he can afford to hire this high-priced labor. Please do not understand me that I am complaining of the conditions that now prevail and want to go back and live those old days over again. I believe in going forward, making the best of things and making all we can out of our orchards. And really a great deal depends on the marketing, how often have we seen the grower get rid of a fine crop of apples and get almost nothing in return, or at least comparatively little. A great many people this year said they

wanted to sell their apples as they hung, did not want to be bothered with them, did not want to board any one concerned with the deal.

Can the fruit grower expect some one else to do this work for the pleasure of it and live on wind while doing it? I presume if he does, he will be disappointed unless he finds some one he can fool.

I think the sooner the apple grower learns to market, or at least pick and pack his apples in good shape, the better for him.

We should prepare early. There is nothing like being ready for anything; therefor, do not neglect getting your packages ready, either boxes or barrels, whichever you intend using.

I think for the present the barrel is best for us Missouri apple growers. After we learn to keep our orchards like gardens, prune, cultivate, spray, wash, thin the apples and do the work right like our western brothers, then, no doubt, the box will take the place of our barrel. But for the present, and that is what we have to deal with, I would say use the barrel.

Also have ladders and baskets ready for use, and as soon as the apples will do to gather, begin with a reasonable amount of this high-priced labor. If then there are enough good wind falls, pick them up and sell them to some one shipping in bulk.

Now comes the important part of our work. Great care should be taken in the picking. The apples should be pulled off and laid, not thrown, into the basket, and care should be used in emptying on sorting table to not bruise the apples. This part of the work done properly gives the packers a chance to do their work right. The packer should see that he or she puts in a nice perfect face, then as the barrel is filled, do not let any leaves go in and all A No. 1 apples. Don't think you can fool somebody and put in a few poor apples in center of barrel. Shake the barrel well and fill it full. The top apples should be bright and well colored and turned on the side and laid in rows around and all level, leave no holes or slack places. The head will go in much easier, and when taken out you will not find some of the apples all mashed to a pulp, and the head not touching others, but you will find the head pressing gently on all the apples, and if the barrel is stored it will keep full and not get slack near so soon. I would not advise the fruit grower to hold his apples, but they should be packed so they will be in good condition to be stored, and the man or firm that wants to go in to this business, can and will use good packed stuff much more profitably and can pay you a higher price. I do not care how good your apples are, you will have some No. 2 stuff. This should be cared for at the same time as the number one, and should be shipped in bulk. It should not be all bruised and pounded up, but should be handled carefully and cleanly. Only clean cars should be used and the leaves and dirt removed.

Since the Pure Food Law came into operation, we have a good market for cider vinegar, and there are vinegar plants that use immense quantities of cull apples. However, the price paid for these apples is low, and sometimes may not pay a profit over the cost of gleaning them up with our high-priced labor. We have found this part of the work can be done quite profitably by an army of red hogs. We think the red hog should have access to the orchard all the time except perhaps one month before and during harvest time, that is after the orchard begins to bear.

I wish to call special attention to doing the work all neatly and carefully. The grower's name and address, and name of apple, should be put on face end of barrel with a neat rubber stamp. As soon as the barrel is packed, it should be taken from the orchard, kept dry and clean, and sent to market at once. If we will do our work properly and honestly, we will have a better opinion of the middle man, and he will certainly have a better opinion of us.

Then, dear friends, we will have no trouble to sleep. We will have a clear conscience, and that is worth more than all the apples with the red hogs and land thrown in.

Furthermore, not only this but your bank account will surprise you. It will be larger than you expected, and this is always quite agreeable to any and all of us.

Wishing my apple grower brothers success, and hoping the time may soon come when each grower may successfully market his apple crop, I thank you.

DISCUSSION.

Mr. Ferguson.—How about hogs in the orchard?

Mr. Murray.—They will eat up all the faulty apples, and you won't have so many worms next fall. However, this can't be depended upon to control the insects, as it will still be necessary to spray.

Mr. Squires.—I don't believe hogs ought to be put in the orchard at any time. They destroy very few worms, and they often injure the trees. Trees are easily killed if the hogs rub against them in warm weather. Instead of using hogs to keep the orchard clean, it will be better to use a mule and a cultivator.

Mr. Darche.—A young man was asked how he raised such fine apples. Did he do it by spraying? No, he just turned the hogs in.

Mr. Weston.—I take it for granted that turning the hogs in the orchard is to get rid of the refuse fruit after the better apples have been harvested. I did not want to turn hogs into my orchard, so I told some of my neighbors that they could have all the apples they wanted at ten cents a bushel if they would pick them up from under the trees. In this way I

cleaned up my orchard without using hogs, and at the same time helped a great many poor people.

Mr. Squires of Kansas.—Damage by hogs in the orchard depends upon circumstances. It is safe if there is no water or mud in the orchard. If the hogs are wet or muddy, they will kill the trees by rubbing against them. Otherwise it is safe to have hogs in the orchard.

MISSOURI CHERRY GROWING.

(By Dr. J. C. Whitten, Professor of Horticulture, University of Missouri.)

Missouri cherry growing is largely confined to the sour types of cherries. Sweet cherries, which thrive in sea-coast regions, are not very successfully grown in Missouri. The sour cherries, however, are the better for cooking and canning purposes. Where sufficient sour cherries are grown so as to market in quantity, they are one of our most profitable fruit crops. The demand always exceeds the supply at fair prices. Furthermore, in this climate cherries are a fairly safe crop. They are much surer bearers than many of the other orchard fruits.

Cherries reach their best development in well drained soils. If the soil is sandy, so much the better. Higher elevations are best adapted to them. They are not gross feeders, and will frequently thrive on thin soils. Almost any land in Missouri which is well drained will produce fairly remunerative results in cherries.

Varieties.—The best varieties for this State are Early Richmond, Montmorency and English Morello. These have generally proven successful in this State. As with most other fruits, however, there are successful new varieties coming into use from time to time. The Dukes and sweet cherries are occasionally planted sparingly for home use. They are not sure enough bearers, however, to be recommended for commercial purposes as a rule, in this State.

Selecting the Trees.—One year old cherry trees are probably preferable for planting, provided they have made a strong growth and are well branched. Cherries are difficult to grow in the nursery, except in certain soils. Sometimes one year old trees do not reach good size. In such cases it is probably better to plant two year old trees. For commercial purposes, trees for planting should not be more than two years old.

Preparation of the soil.—The soil should be thoroughly plowed, harrowed and pulverized. Planting may be done either in spring or fall. In the southern half of the State where the winters are less severe, many growers prefer autumn planting. In the northern half of the State where the winters are colder, early spring planting may possibly have the ad-

vantage. Cherries, however, may be successfully planted either in autumn or spring. The trees should be set in check rows, 20 feet apart each way. They should be set about as deep as they stood in the nursery. The soil should be packed firmly about the roots, leaving an inch of loose soil spread on top to prevent baking.

Cultivation.—After the trees are planted, the orchard should be given thorough cultivation for one or two years until the trees become thoroughly established and begin vigorous, active growth. The cultivation should be about the same as that which is given corn. Once the tree has become thoroughly established and in vigorous condition, which should be at about the end of the second year, it is customary to seed down the cherry orchard to clover. From then on it should be left permanently in sod.

It is not clear to most growers why cherry trees do not respond to continued cultivation as do peaches. The feeding roots of the cherry usually form abundantly near the surface of the ground. These feeding roots are no doubt more or less broken by cultivation after the tree reaches some size. Roots, which are broken off are not quickly replaced. The cherry is one of the most backward of the fruit trees in putting out new growth where old growth has been broken off. This is as true of the root system as it is of the branches above ground. The disadvantage of cultivation probably lies largely in the fact that it breaks too many roots, which are not quickly or readily replaced by the tree. Sprouting or suckering from the roots frequently occurs if cultivation is kept up. The tree should not be cultivated much after midsummer, as it may cause it to go into the winter with green, unripened growth.

Pruning.—The first pruning takes place at the time the tree is to be set in the orchard. Any ragged wounds at the tips of the roots, caused by digging should be cut off with a smooth cut. If any main root is long enough that it cannot be gotten into the hole for planting without bending, it should be shortened. It is better to shorten the root than it is to have it twisted out of its normal form in planting.

The shape of the top requires great care. The cherry, perhaps, needs to be pruned less than any other fruit tree. Most of its fresh active buds are near the tips of the branches. The buds on the main stem and low down on the limbs become very dormant and inactive. New growth can push readily then only from near the terminals or growing tips. It is a mistake then to cut back the limbs, as the active buds will thus be removed, and the remaining parts of the tree will not readily push into growth. If it is necessary to remove any of the top of the tree to balance the cut root system, it is probably better to cut out a limb entirely, than

it is to shorten it. If the tree possesses more than three to five main limbs, the remainder may be removed entirely.

Many growers prefer to cut out the leader or central stem above the point of heading, leaving three to five main branches, which become the framework for the future head of the tree. The writer prefers this open head system of pruning for the cherry.

These main limbs should subdivide again until the necessary number of branches of the tree are finally produced. If a main limb starts a single shoot of new growth from its tip, it may be induced to branch again by pinching the growing point. At the end of the second year the head should be formed then by 3 to 5 main limbs starting from the trunk, and each of these dividing into two limbs at the end of the first year's growth. After this, enough branches should be allowed to form to give good fruiting surface. Close, crowded or rubbing of limbs, however, should be avoided, and the center of the tree should be kept sufficiently open or vase-shaped to admit sunlight and air. If the young tree is properly shaped during the first two or three years after it is planted in the orchard, only a little subsequent pruning will be needed each year. It will not be found necessary ever to cut off any large limbs. Removing large limbs from a cherry tree should be avoided, if possible. Perhaps the only justification for cutting off a large limb of a cherry tree is where for any reason, the limb dies.

The most serious disease of the cherry in this State is the leaf spot fungus. Occasionally the fruit may be attacked by the curculio. The leaf spot fungus is held in check quite successfully by spraying with self-boiled lime sulphur. Arsenate of lead is the best poison for the control of the curculio. These two sprays may be combined where both are to be used.

PLANTING AND MANAGEMENT OF CHERRY TREES.

(By D. A. Turner, Sr., St. Joseph, Mo.)

In this brief discussion we will commence with the soil. Cherry trees require a dry, well drained soil. They don't do well at all in wet land. They live and thrive, and do well in a sandy loam, such as that found along the Missouri river bluffs. The land I live on is composed of sandy loam and clay, and cherry trees do extra well on that kind of soil.

I planted a cherry orchard thirty years ago, and the man I bought the farm of remarked: "That man is crazy to put out one hundred cherry trees." Thirty years ago the community around here did not know what a cherry orchard was. I sowed the ground about my trees in

timothy and never cultivated the orchard for twenty-five years. The trees bore well after they commenced to bear. For a number of years following after that many limbs were broken from the trees in picking and from heavy loads of fruits. Three years ago I cut these trees down and broke up the ground and put out more cherry trees. I do not know of any better paying fruit than cherries.

You that have failed to raise strawberries, grapes or cherries have neglected some of the best paying propositions in this country. Any one can grow cherry trees along these hills of sandy land. The fruit from one acre of my old trees brought in an average of $25.00 per year for a long, long time. My new cherry orchard consists of five hundred trees. I consider the cherry to be such a splendid paying crop that I believe many are neglecting the best crop that they can grow on many soils.

Cherry trees begin making profitable yields at seven to nine years of age. At that time they will produce seven crates of fruit each, and this will bring $2.40 per crate. With one hundred trees per acre, you could see what your annual profits would be.

Cherry trees may be set from sixteen to twenty feet apart each way. If grass is sown in the orchard, it will be necessary to have room to get in with the mowing machine. When the trees are young the grass may be raked off the ground, but later all of it should be left as a mulch.

Cherry trees do not need very much trimming when small. After they have become well established and are growing nicely, they may be trimmed so as to head them at the right height, and shape them properly, but all pruning should cease after they are four or five years old.

I rarely ever cultivate after the fifth year. It is all right and perhaps best to cultivate trees for the first four or five years after planting anyway, to cause them to make a good growth. After cultivation ceases, the ground may be seeded to timothy or some other grass. Besides timothy, I would recommend clover, the alsike clover being the best.

As to varieties of cherry to plant, I would name first the Montmorency as being the best of all. The Early Richmond and English Morello are sometimes planted, but I do not care to recommend them.

DISCUSSION.

Mr. Maxwell.—What did you say was the best variety?

Mr. Turner.—The Montmorency.

Mr. Wilkerson.—What variety of the Montmorency?

Mr. Turner.—I don't know; just the ordinary Montmorency. I have had some Morellos, but they do not do well with me at all, as they winter kill.

Question.—Do you recommend spring or fall planting?

Mr. Turner.—The first trees I set was in the fall, and I lost just one tree out of one hundred.

Question.—Which do you consider the best late variety?

Mr. Turner.—I consider the Montmorency the best for all seasons and all purposes. If I were setting an orchard of one hundred trees I would plant ninety-nine Montmorency, and then plant the other one Montmorency also.

Mr. Squires.—How about planting cherries on clay soil? Have you had any experience?

Mr. Turner.—Yes, the first orchard I planted consisted partly of land with clay and rock, but I could not see any difference in the trees.

Question.—I should like to ask what you think of the Wragg variety?

Mr. Turner.—It is no better than the English Morello. If a man wants to spoil the looks of his apple orchard just let him set out a few rows of English Morello, and a few of the Red Wragg, and he will succeed. The Morello is not hardy in this climate, and it will not be long before the trees of that variety begin to drop out. There is another variety that I might mention, the Governor Wood, a sweet cherry, which has done well. Some people like it very much. I have one tree twenty-six years old, standing on high, very poor sandy soil, which bears every year.

Mr. Stark.—Sweet cherries can be grown in this part of Missouri, but not so well as in New York. Trees should be headed low here. In general, cherries of all kinds must have a dry, well drained soil. In the west, particularly in Colorado, they are growing cherries without irrigation. They are growing the Montmorency pretty largely, and I know this is to be a very safe variety, and, in fact, the best of all. They can grow excellent sweet cherries in Colorado, Idaho, Michigan, Washington, Oregon, etc. In Michigan the Black Tartarian sells for $4.00 per crate, which amounted to $40.00 per tree, a total of $4,000.00 per acre.

Mr. Weston.—I have lately set out some cherries on sandy loam with a clay subsoil. I planted fifty Montmorency and fifty English Morello. As I am interested in cherry growing, I will ask Mr. Turner what he thinks of this, that is, if black loam with clay subsoil is good for cherries. If I have made a mistake, I do not want to plant any more trees.

Mr. Turner.—I think the soil is all right, but I believe you set out too many of the Early Richmond. The market can use only a few of the Early Richmond cherries.

PEACHES AND PEACH GROWING IN NORTHWESTERN MISSOURI.

(By Pat. Woods, St. Joseph, Mo.)

Twenty-five years ago, peach growing, that is, the growing of high quality peaches was something that was hardly thought of. I have always had some good seedling peaches. One of these seedlings was a red-fleshed kind, known as the Indian peach, and in this, one sometimes found some extra good strains. My first experience with budded fruit was a failure. I tried again, but that year there were no peaches raised around St. Joseph. I cut out the dead wood and also cut out some of the trees, and the next year I had some peaches. The following year I put out one hundred trees, and they were a success.

Now, a peach orchard, like an apple orchard, needs care. The elements play a big part in peach orcharding. One of the most essential things in peach growing is that the orchard must be located upon high land. The Missouri river hills are good for this purpose. All who have grown peaches know that they should have a high location, and that the soil must be dry. However, those of us who have had to try all of these things in order to secure the information, are about ready to die by the time we have learned every thing. In the valleys in this part of the State, scarcely any peaches are grown, because there is too much danger from late spring frosts. Grown in a dry soil, like that recommended for cherries, the buds remain dormant during late winter, and, therefore, are not injured by the severe freezes we are likely to have. In the low places the frost line may be easily seen on the hill sides.

My advice to young men starting in to make money is to go into the peach business. I planted a forty-acre orchard, and can say that I have had success. Regarding the pruning, I will say that I do not prune much except to dehorn the trees. After the trees have produced two heavy crops I cut them back severely, then cultivate the orchard for three years, and then seed down to clover and timothy. The clover soon dies out and is succeeded by the wild fox tail grass. During the first five years small fruits may be grown between the rows.

The trees should be planted from eighteen to twenty feet apart each way. The best varieties with me are the Greensboro and Champion, but these are not as good for shipping as the Elberta and Elberta Late. Some of the early peaches won't stand shipping at all, but when we come down to the Greensboro, Champion, Crawford, Elberta and Elberta Late, we find that these are not only fine varieties, but ship well.

DISCUSSION.

Prof. Dutcher.—What slope is best for peaches?

Mr. Woods.—No slope at all. It is best to plant peaches on top of a ridge or hill.

Prof. Dutcher,—Mr. Woods spoke about dehorning his trees. I would like to say that cutting back and dehorning are quite different. The latter is a much more severe process than the former.

Mr. Johnson.—A few years ago, probably ten or twelve, dehorning or cutting back peach trees first came into notice. At that time I had just bought my suburban home in Kansas City, and on that place were quite a number of seedling peach trees. I remember very well my experience in cutting back those trees. I was afraid to cut off very much, but I finally cut pretty severely, and occasionally took off a large limb. I finally concluded to dehorn most of the old trees that way, and await results. In the condition they were I saw they were not going to do me much good, so I cut them back very low. If you were to go in my orchard now you would find my peach trees are still being cut back, so that the trees are kept low, and the fruit easily reached. If peach and apple trees are growing in the orchard together, the peach trees will have to be kept severely cut back. I allow nothing to interfere with my apple trees. When there is any danger of crowding, it is the peach trees that are reduced in size. Just how much we should cut a peach tree cannot be stated. Every tree has its own individuality. The orchardist must use his judgment. You cannot go into your orchard and trim trees according to rule.

INSPECTION OF NURSERIES AND ORCHARDS.

Mr. Turner, member of the State Board of Horticulture for the northwestern part of Missouri, made a statement regarding the efforts of his Board to secure some legislation which would provide for the adequate inspection of the nurseries and orchards of the State by creating the office of State Horticultural Inspector. A summary of the proposed bill, providing for the inspection, was read to the meeting. Mr. Utz then read the following resolution, and moved its adoption:

Resolved, That it is the sense of the St. Joseph Horticultural Society and other fruit growers present at this Horticultural Institute, that the proposed inspection bill read in our hearing be approved; and, be it further

Resolved, That we second the efforts of the State Board of Horticulture in having the measure passed at the coming session of the Missouri Legislature.

The resolution was seconded, and by unanimous vote of the meeting, adopted.

WESTERN ORCHARD METHODS APPLIED TO MISSOURI CONDITIONS.

(By E. H. Favor, Associate Editor of *The Fruit Grower,* St. Joseph.)

During recent years the western orchardists have made a "noise" about their fruit that has been heard throughout the civilized world. In every country on the globe western apples have made their appearance and created comment among the populace.

Fruit growing in the far western states is not as old an industry as in New York state, dating no farther back than 1847, when the Mormons arrived on the shores of the Great Salt Lake, and two years later were followed by the great rush to the gold fields of California. Prior to that time the far northwest was populated only by Indians and a few venturesome cowboys and prospectors, although the hunters of the Hudson Bay Company occupied the territory as far south as the present state of Oregon.

The large amount of interest which is at present shown in the fruit growing methods of the far northwest are due to a variety of conditions, some of which are purely local, most of which are general and only the most important of which are open to consideration here.

There seem to me to be five principal reasons for the wonderful records produced by the orchards of the northwest. These are the cooperation that exists in each community, the high quality of the fruit, the packing methods, the personality of the growers and their persistent advertising.

Co-operation is the character that is most marked in the fruit districts of the northwest. It appears in some form in everything that is done from the time the sage brush is cleared for the new orchards until the orchards have come into bearing and the money for the crop is in the bank. The outside world hears lots of and knows much about the work of the associations which exist in almost every fruit-producing community of the northwest. These associations or unions came as a matter of necessity. They simplified the matter of marketing the products of the orchards and of purchasing the supplies needed by the ranchers. In simplest terms the community becomes a single individual in the commercial world, with salesmen and special representatives in all of the large markets.

The associations were organized, as you know, after individual marketing had proven itself to be a money losing game. The growers found out, by bitter experience, that it was a far safer plan and better business to put all of their buying and selling into the hands of one of

their own number, with whom they were personally acquainted, who could live among them and whom they could watch, than it was to consign their crops to commission dealers in cities a thousand or more miles away.

This matter of co-operation is noticeable in the small farms and compact communities. In the majority of the great orchard districts of the northwest, fruit is grown by irrigation, and under such conditions one cannot care for as great an area of land as is attempted under rain-belt conditions. The average size of an orchard in the northwest is ten acres, and as a rule there are hundreds and even thousands of these little orchards adjoining each other and making up an enormous area of fruit. These orchards, unlike so many in the states east of the mountains, are made up of practically the same varieties in each community. In other words, the growers co-operate in producing the same variety or varieties of fruit. If it is found that Spitzenburg, Yellow Newtown, Delicious, King David, Jonathan or Bellflower are the best varieties, the growers will plant of these, although their personal choice may be for other kinds.

Co-operation is manifest in the general cultural methods. The growers work together in the matter of spraying, cultivating, irrigating and all of the operations necessary to produce their respective crops, with the result that their products are uniform and of the highest quality.

The northwestern fruit-growing sections have possibly made their greatest and most enviable reputation on the quality of fruit put out from their orchards. This is partly due, of course, to their wholesome co-operation, but also due to no small extent to their delightful and favorable climate. In the clear, dry air of the irrigated sections, the orchardists are not annoyed by the numerous insect and fungus pests that prevail throughout the rainy sections. But they have their troubles just the same, and they spray and fight bugs with all of the vigor that characterizes the thrifty and progressive westerner.

The high quality of the fruit in these irrigated sections of the west comes also from the general cultural methods that are followed. The western orchardist is an advocate of thinning, and not only does he advocate it, but he practices it. He has found out by experience that the tendency of his trees is to regularly over-bear, and that the fruit on a heavily-loaded tree will not run in size as well as when carrying a lighter load. He has also found that it costs less to pick apples in June than it does in September.

The western orchards are pruned according to the fullest meaning of that term, and in a large way the co-operation of the people shows itself in the similarity of the style of pruning that is used in each section.

This careful and consistent pruning helps to produce good fruit, and when a fruit-grower is a "tenderfoot" and an inexperienced orchardist, he always has the inspector to fall back upon. The western orchard communities always have inspectors, whose duty it is to advise with the fruit-growers about any and all operations they must do. There are inspectors for orchard pests, for picking, packing and shipping; and in most cases the inspector is the most highly respected man in the community.

The western orchardists have made themselves prominent in the fruit world by their styles of packing. The box is recognized as a western package. It had its origin in the orange districts of California, and quickly found its place in the deciduous orchards of the northwest. But the packing of western fruit does not consist alone in putting the fruit in the box. It begins with the picking. Western fruit men are uniformly very particular in the manner of picking their fruit from the trees. The picking gangs are small, and each is under the control of an inspector, who sees to it that the fruit is carefully handled. Apples are not jerked from the trees and thrown into a box or basket as though they were so many stones. In fact, just the opposite. The apples are handled just as gently as though they were eggs. The pickers are provided with buckets or bags in which to pick, and these buckets are emptied carefully into lug boxes, made especially for the purpose. These lug boxes, when filled, are then piled two deep on a flat-topped wagon and hauled to the packing house. Here the fruit is graded according to size, color and condition, before being passed on to the packers.

There is system in every movement, and the system and co-operation show most prominently in the packing of the fruit. It takes an expert to pack apples in boxes according to the standards of the best sections of the west. But the number of expert packers has not kept pace with the increased demands, so that packing schools have become prominent features in most of the big districts of the northwest. These schools are maintained by individuals, communities, associations or shows and aim to teach the growers how to pack their fruit in the most approved manner, and they have served their purpose well.

It is no doubt a fact that much of the success achieved by the western fruit men has come about through their enthusiasm, optimism and egotism. The western fruit grower is all of these and more. He is a booster from the ground up. He never hesitates to hold out the glad hand to a stranger, and to tell about the good things of his own little valley or his state or the glorious west. It is a contagious spirit, a wholesome spirit, and has been one of the means of bringing the west into its present position in the limelight of publicity. It is the thing that has

brought professional men, business men, good farmers and mechanics from the eastern cities and states and landed them on the farms of the west. It is the thing that is making the west the most highly developed and most intensely cultivated and highly specialized section of the American continent.

In his enthusiasm to let the other fellows back east know what good things he has, there has resulted some of the most remarkable advertising undertakings ever promulgated. To be a fruit grower in the northwest means to be an advertiser, for the advertising of the possibilities of fruit growing has been most concretely done in the good packing. They have told the world through the press that they had good fruit, and through their good packs they have delivered the goods. Through their fruit shows, which have now become so popular, both west and east, they have increased public interest in fruit growing, and through space advertisements, news items and stories in the daily papers, magazines and journals of the east they have continued to draw from the eastern population until the present census has just shown that some of our good farming states of the east have actually lost in population. The good fellowship of the west is the power that runs the machine.

Thus far this may seem like a boost for the west, but it is not so primarily. It is the way western fruit growing looks to a Missourian like myself, and it seems to me that some of these western methods can be applied here in Misouri and others cannot. We can spray, we can put up honest packs, we can advertise our orchard and our lands to as much advantage as the westerners, and we can increase the population of our farming communities through smaller farms and more intensive cultivation.

The westerners have used modern methods all the way through, and have not been afraid to go a step ahead if necessity demanded it, even though they did get laughed at. They have made a fuss about everything they have done. Missouri can do it just as well. Missouri orchardists need to wake up and realize that a new day has come. Misouri can produce good fruit, and lots of it, but the quality that is demanded by the markets of today cannot be obtained by following methods that were out of date twenty years ago.

The climate of Missouri allows a greater number of insects and fungi to thrive than is the case under the cloudless skies and the dry air of the west. For that reason the Missouri fruit-man needs to get away from the idea that if he can get a thousand barrels of apples off a ten acres, a thousand acres can be made to pay in the same proportion.

Missouri fruit growers can co-operate in the marketing of their

crops and obtaining their supplies, but possibly not to the extent or in the same manner as in the northwest. In the Ozarks there are some communities, however, which have the matter of co-operative marketing pretty well solved.

Missouri can profit by the example of the western people in the matter of spraying and heating. The western people do not ask that old, old question, "does it pay to spray?" They are not now asking "does it pay to use orchard heaters?" They know they cannot afford to not spray and spray thoroughly, and as often as the case demands, and they know that orchard heaters are the salvation of their crops. As long as Missouri orchard-men insist in letting nature care for their orchards, western fruit growers are planting more trees and doing every operation just a little better than was done the year before, until the time will come that such a flood of fine apples will roll over the Rocky Mountains that it will be a hard matter for Missouri to ever take her proper place in the game.

Missouri fruit growers need to get busy and keep busy. Good fruit can be grown in this State and is being grown; just as good as any the sun shines upon. But what is ever said about it? Nothing. In the northwest the growers are busiest with the press agents at the times they are busiest with their crops. It will be the best investment Missouri has ever made to line up today with the great publicity agents and keep going the good work of telling about Missouri, the work that was so well started with the "Missouri Book" at the Louisiana Purchase Exposition.

Modern methods, small orchards and intensive cultivation with judicious use of printer's ink and the increase of the area of orchards in sections that are adapted to fruit growing, will put Missouri in the front rank as a fruit-producing State. With the start Missouri already has, this rank can be easily reached, but it will not come by filling the markets with wormy, scabby, badly packed fruit.

PEACHES AND PEACH GROWING IN NORTHWEST MISSOURI.

(L. J. Hartman, St. Joseph.)

Much has been learned about peach culture within the past four years. Where now the peach is the most profitable of all orchard crops, it is also, perhaps, the most beautiful, most tempting and luscious of all northern fruits. There is no fruit marketed which brings a higher price than well grown peaches.

At one time it was supposed that only sandy soil was adapted to peach culture, but later it has been claimed that clay loam, if properly

FIG. 2. Governor Hadley was an enthusiastic visitor at the Peach Carnival held at Brandsville, Koshkonong and other points in the peach belt of South Missouri summer of 1910. This view shows the Governor standing by a loaded peach tree.
—Photo by A. A. Coult, St. Louis.

FIG. 3. Governor Hadley and party motoring through the Hitts' peach orchard at Koshkonong, Oregon Co. The Governor is sitting in the rear seat, on the left. In the front seat, on the left is Mr. R. M. Hitt, President of the State Board of Horticulture, and one of the owners of the orchard.
—Photo by A. A. Coult, St. Louis.

cultivated, is by far the best for peaches. The soil should not be made too rich, as the peach is a very rapid growing tree.

It has been recently discovered that there are varieties of peaches that are very hardy in bud which scarcely ever fail to bear a profitable crop when other varieties around them are entirely destroyed by the severity of the winter.

There is no fruit tree that can make as quick a return as the peach. Give it reasonable attention and in three years from planting, a fair crop will be gathered; a few the second year, and the receipts from a good orchard are something of importance. Sometimes it overloads its branches with fruit.

Peaches will succeed on a great variety of soils. Worn out land and poor soils that would require years of careful handling to produce a good crop of grain can be readily utilized for peach land, and is preferred to land that is stronger. Improve the land after the trees are set.

Starting with such land I would proceed by first plowing and pulverizing, then dig holes large enough to accommodate the roots, and tread firmly with the foot. Leave three or four inches of the hole to be filled with well-rotted manure. Plant trees twenty by twenty feet each way.

The best varieties to plant for money are the Elberta, a fine yellow freestone, Mathew's Beauty, a large late yellow freestone, fully as large as the Elberta, and two weeks later. I would advise extensive planting of this sort. Pool Favorite is a late yellow freestone peach, three weeks later than the Elberta and one of the best late.

Much might be said about the fruit and marketing, but this would require volumes. The most important point is not to allow the trees to overbear. Never prop a limb to prevent breaking, but thin the fruit. This will make better fruit and longer-lived trees.

Fruit should be graded and culls utilized without sending them to market, unless when very scarce.

Plant good trees in good land, and success is only a matter of time.

SOME NEW HOUSE PLANTS.

(By R. G. Rau, Superintendent City Parks, St. Joseph, Mo.)

New varieties of house plants are constantly appearing upon the market, but unfortunately, not all of them which are recommended will come up to expectations. New forms of the well known Boston Fern are among the most interesting of the new house plants. These ferns will do well in most any temperature that would be suitable at all for plant life in a residence. Most plants which will thrive in a temperature of

seventy degrees, will not make a good growth in a temperature of fifty degrees, and the reverse of this is also true. With ferns the main consideration is to keep them moist all of the time, and never expose them to full sunlight.

Among the best new geraniums are the Red Wing, Gurney, Mann, John Lemmon, The Dagata, and a seedling, which originated with us, called John. The John is a white with pink eye, which bears twice as many flowers as any other geranium we have had. Geraniums will make good house plants if kept at a temperature of about fifty degrees at night and a little warmer in the day time if no cuttings are taken. Geraniums will bloom much better in winter if they have not been allowed to bloom the previous summer.

Some of the chrysanthemums will bloom from September until Christmas if kept cool and wet. A few of the better new varieties are Papworth, Albee, Donetello, Adonis, etc. Chrysanthemums will make nice house plants if fed well during their growing period.

An improved variety of the Norfolk Island Pine, the *Araucaria robusta compacta,* is sure to be a winner. It is far superior to the old form.

A white-edged form of the asparagus fern (*Asparagus Sprengeri*) has appeared, which is of great promise.

There are always new azaleas coming out, but many of them are often a disappointment, as they do not do well. Azaleas make some of the nicest of house plants, and they can be kept for years. Azaleas have to be kept in a place that is partially shaded, and they never should be allowed to become dry. In this respect, they are more exacting than ferns or begonias.

Some of the promising new Rex Begonias are Sander, Majesty, Schadendorf, Moon, etc. Among the new flowering begonias the Glory of Cincinnati is the best.

New varieties of hyacinths, tulips and narcissus are constantly coming out, but as a rule, they are for the most part very slight improvements over the older ones. The main consideration in the successful forcing of hyacinths, etc., is to bring the well-rooted bulbs in the house, keep them moist at all times, and see that they are kept cool when in bloom if we wish them to bloom for a long time. Too much water will ruin nearly all flowers at all times, but this is not true with the hyacinths and tulips when grown in the house.

There are some new types of cyclamens that will make excellent house plants, as they seem to thrive extra well in living rooms. I have had plants of these in the office with as many as thirty-six flowers on them at one time.

One of the most successful winter flowering house plants is the Christmas cactus or *Epyphyllum truncatum*. This will stand more neglect than anything I have ever seen, and at the same time, it will continue to improve from year to year. This cactus will bloom for people who do not succeed with other kinds of plants. We have lately received eleven new varieties from Europe, and they all do well.

Sometime ago we grew a new white *Impatiens sultani* from seed, which thrives as well as the original pink variety.

Among the foliage plants I will mention the *Ficus pandurata*. It is an excellent new improved rubber plant, which does as well as the old form of rubber tree.

Among the new palms, the only one that could be recommended is the *Phoenix Roebelinii*. This new form is as hardy as the *Kentia* and as graceful as the *Cocos Weddeliana*. Palms certainly make excellent house plants if they are kept like ferns, moist and in a partially shady place.

Among the new Easter lilies are the *Formosum* and the *Gigantium*. Both of these have to be well rooted before being forced. This is always the main consideration in growing Easter lilies. There are a few Calla lilies coming out from time to time, including dwarfs, yellow and black forms. However, all of these new departures soon disappear, and we go back to the old variety. In growing Calla lilies the main considerations are heavy feeding and watering and drying off in summer.

A new carnation, called Christmas Cheer, is soon to be disseminated. This proved to be a big improvement on all of the other carnations as a house plant. The Christmas Cheer is a dwarf and free flowering in habit.

Of the Cinerarias and primroses there are some with new colors. These new forms will be very fine to adorn a room in winter, as they do well under ordinary treatment. They should be kept at a temperature of about fifty degrees. They thrive best if the soil is kept wet.

Cannas are not often used as house plants. However, they would be useful as they bloom during the whole winter. Two new varieties have originated with us. One of these is dark red with yellow edges, has large flowers, and is an improvement upon the Anton Crozy. It is considered to be one of the best cannas out. The other one has a deep rich yellow flower, with red spot, similar to Florence Vaughan.

I have originated a new ageratum, which is called President Uhlinger. It is a dwarf with large flowers and extra free blooming.

We have originated something over twelve good distinct new varieties of coleus. There are other new forms among these seedlings in addition to these. The following are some of the named varieties: The J. D. Richardson, W. D. Webb, John Donovan, Van Brunt, W. D. Maxwell, Getchel and Mayor Clayton.

We also grew from seed sometime ago a new lantana. This new form bears two different kinds of flowers on the same plant. The color of one is pink and the other yellow.

Sometime ago there was a new heliotrope introduced from France, called the Centefleur. This is supposed to be the best one of its kind. The Slavia Zurich from Switzerland, another variety, is a record breaker, as it blooms about all the time. This last is a decided advance in floriculture and raises the art to a much higher degree of popularity.

Of the roses, some of the new ramblers are great triumphs. Unfortunately, roses to not make good house plants, as the dry atmosphere of the average residence is not suitable for their development. Roses, also, cannot thrive in great extremes of temperature. I hope we may eventually have a rose which can be successfully used as a house plant.

LEARNING THE FRUIT GROWING BUSINESS.

(By Mrs. S. N. Cox, St. Joseph, Mo.)

Enthusiasm and strenuous effort, if fairly well directed, will often bring even a prosy, incapable person into prominent places many times where he is not able to make good, or, in other words, deliver the goods expected of him. In such a place I find myself this evening. I will frankly admit that I felt somewhat puffed up by Prof. Howard's request, but when he was candid enough to give his cold, unvarnished reasons for such request, I immediately found myself stripped of all egotistical conceit which I might have been disposed to feel. The Professor's closing remarks were as follows: "Your experience will be particularly helpful to a large number of persons who are just entering the fruit business and want to know the A B C's of orcharding. Most of the papers read by old growers shoot over their heads entirely." I do not know that anything I shall say will be of any great assistance to the A B C people mentioned, but I promise absolutely there will be no "over-head stunts."

The magnitude of this subject, to one with such a limited experience as I have enjoyed, should cause a thinking person to hesitate before attempting to say anything in the presence of our experienced and successful fruit growers and our University friends, who are all scientific horticulturists.

I consider it a kindness, indeed, that he who has assigned this interesting subject to me has given it in the present tense, that of learning, for after years of strenuous study and labor we feel that we are beginning to know just a little about the fruit growing business.

FIG. 4. A beautiful Southwestern Missouri apple orchard. Twenty acres of eight year old York Imperial owned by Dr. E. L. Beal, Republic, Mo.

As there has always been a tendency to look down upon the tillers of the soil, as if they were beneath the toilers of the commercial and manufacturing world, some of our friends were amazed that we, who are nearing our fiftieth milestone, should plunge into anything so arduous and different to our former efforts. This false standard of labor has greatly retarded one of the most intensely interesting, ennobling and remunerating resources of our nation's wealth. Right here we encounter one of the most emphatic reasons why the elements of agriculture and horticulture should be taught in the rural schools as a creator of interest in all plant life and the wondrous creative power and vitality locked up in our soil. It is evident that the successful fruit growers of the future are going to be men and women of the highest intelligence, and close students of the developments of the sciences of agriculture and horticulture.

Our friends have given us credit for a more liberal amount of energy than we deserved, for it was in the beginning simply our intention to make a suburban investment, and thereby suddenly get rich, as did the Astors of New York. The investment is all right, we still think, especially now since the Ad. Club has so intelligently and enthusiastically taken up the plan of giving us a City Beautiful, with its suburban parks and splendid boulevard system, and added much caste to our city by the employment of our new landscape architect, George E. Kessler. But before these efforts of the Ad. Club, the location was not New York, and as we were the ancestors in the Cox family, we had to roll up our sleeves and go to work on this run-down fruit farm. I had early learned in my former profession the value to be gained by a close study of journals and gazetteers, so I at once started out on a still hunt for a good monthly journal on fruit growing, and as the City Library had been for years my favorite resort when in school work, I naturally turned to that source again for help. Going immediately to the office of the Librarian, Mr. Purd Wright, I requested that he make me out a list of fruit grower journals that he could recommend. He replied in the language of a boy, "That will be dead easy, for I know of just one that I consider of any value, and that is a home product, edited by James M. Irvine, called the 'Fruit Grower.'" I had a profound respect for Mr. Wright and his ability to judge, but I must say I felt a little skeptical about the matter, for I had never, up to that time, heard but one person mention the aforesaid journal, and that was the editor's wife, who had never shown any marked weakness for fruit growing or apple shows, so far as I know. I became a subscriber to the Fruit Grower that day, and carried home five or six back numbers that were kindly donated by the editor, and in one of these

numbers found a plan which appealed to us very strongly, from an economic standpoint, for the proper utilization of ground. The plan was as follows: Apple and peach trees were to be planted alternately in rows fifteen feet apart; between apple and peach trees were to be planted blackberries and raspberries, and we added the cultivation of potatoes between all rows. The idea of this plan was that the potatoes and berries would have a commercial value until the peaches came into bearing, at which time the berries would be removed, and the peach trees would have completed their days usefulness by the time the apples had begun to bear. These earlier crops were supposed to pay for the labor in part, at least, necessary in bringing the apple orchard up to fruiting time.

Now, as to our success or failure with this plan: Our varieties were carefully chosen with due regard to advantages of cross pollination and long blooming period, which greatly reduces the risk of total loss during blooming season, besides the best possible varieties for our climate and soil, which fact we owe to the men in charge at the Stark's Nursery. This year the Alton, Champion and Carman peaches gave a splendid crop for three year-old trees, while the Elberta and all other varieties utterly failed; and, as the Irishman said, "There's no use talkin', but the Alton is a peach." So much for varieties.

Against the advice of those who knew, we insisted upon planting some three year old trees, which we know now was a mistake, as was also the berry part of this plan. We find we have greatly retarded, and are very much afraid, have permanently injured the growth of our apple trees on account of the small amount of thorough tillage that was given these trees during their first three years. As I have said, it was the economy of ground in this plan that appealed to us. While there is a seeming waste of space outside the trees during the early years of the orchard, we find a similar waste of space inside the trees when the orchard has grown old, for any orchardist knows that there is only a comparatively thin rim around the periphery, or outside surface of the tree where blossoms open and fruit matures, and American Pomology has problems to solve in pruning before we shall be able to keep our trees in bounds.

Our future plan for this orchard is intense tillage and an effort to keep the trees growing as vigorously as possible by the use of barnyard manure and cover crops turned under annually for humus, in which the soil of this orchard is perhaps most deficient.

Before giving an account of our second attempt at planting a small home orchard, we want to say that we were beginning to think more of soil, location, exposure and good air drainage, and agree with W. A. Irvin of Springfield, Mo., that it would be wise to look ten years ahead in planting your orchard with regard to location, varieties, pruning and

care. We would give equality of soil precedence over location, varieties or care. When such men as Messrs. Rorer and Faurot of the U. S. Department of Agriculture, informed us that we were indeed fortunate in possessing such a splendid quality of loess soil, while we could not properly appreciate the word "loess," we simply looked wise and said little, so when Mr. Rorer modestly added that the same splendid fruit growing soil fringes the Danube and Rhine, I felt a little more at home with the word loess, but somewhat chagrined, as I remembered how much more time I had given to the study and teaching of this foreign soil than to that of our own splendid Missouri river bluff soil, which geologists tell us was last to emerge from beneath the surface of the sea, surpassingly rich in sedimentary deposits so necessary to the elements of fruit growing. As the plains of Dakota were made for wheat fields, and the prairies of Kansas intended by Nature for "waving walls of corn," I believe with the poet that "God dreamed of apple trees" when His hand created these splendid hills and slopes which seem especially adapted to the growing of fruit trees, particularly the apple and peach. Prof. F. A. Waugh's "American Apple Orchard" gives the following rule: "Any soil especially adapted to the growing of Irish potatoes, with a little larger amount of gravel, or loose broken stone thrown in, will usually be satisfactory for apples."

Now as to experiment No. 2. In giving the report of our second experiment, I would say that the exposure is north and east, and that the ground had been given over to the culture of blackberries for a number of years, which we removed and gave a thorough dressing of barnyard manure, which was plowed under the fall before the trees were to be planted, and again plowed in the spring, harrowed, leaving the ground resembling a rich, deep garden bed. The ground was then marked off by the Waugh method given for small orchards, location of trees marked with laths, and right here I want to say my patience became exhausted, for I thought they never would finish this marking and get ready for the trees, which we were expecting at any moment. When I urged that they hurry up a little, the man in charge of this marking calmly replied, "I'm in charge of Mr. Cox's Garden of Eden, and I intend to do it just right," and I think he did, for the lines are simply perfect, vastly different from the first planting. The trees were planted by the use of a particular contrivance known as the "Planting Jack," which did not lose the proper location of the tree one-sixteenth of an inch, so the men said. We used the Fruit Grower's plan, as before, omitting the berries, planted the ground to early potatoes, which were dug and marketed, and the ground plowed in an opposite direction to the first spring plowing; then planted

this ground in sweet corn, which gave us splendid returns, for we were busy marketing this corn until after Thanksgiving, it keeping perfectly in the shocks and sacks. Right here we made our first mistake in Plan No. 2. The late cultivation of the corn caused the peach trees to continue their growth so late that they did not have time to ripen their wood growth; therefore, many of them died during the winter, although it is a fact that many of our neighbors were equally unfortunate in the loss of many, both young and old, peach trees. This year we planted to early potatoes as before, and in August sowed this ground to clover and rye, which at this time is one of the most beautiful cover crops I ever saw, which will be turned under in the early spring to add humus. We will continue this plan of cover crops next year, using vetch. These apple trees have made a splendid growth, considering the dry weather, especially Delicious and Wealthy, leading all other varieties. We keep an orchard book and know just where to find any variety we have planted.

Our greatest success in a financial way has been the renovation of an old apple orchard, consisting of about 450 trees about twenty years old, with southwest exposure. Varieties, Jonathan, Ben Davis, Gano, Willow Twig, Maiden Blush, Rambo, Huntsman, Summer Queen, Bailey and Lady Sweet. These trees had been simply growing wood, with the exception of one or two crops of badly infested fruit before coming into our possession, and the problem confronting us at first was to remove at least a part of this excessive wood growth, which was begun by removing all dead, broken and interfering limbs, and partially opening up the heads of the trees to the action of the air and sunlight, covering all wounds with two coats of heavy white paint. The trees were then thoroughly scraped, removing all old shaggy bark with a triangular tool similar to that used by butchers for cleaning their meat blocks, this being done so that a reasonably smooth surface might be obtained for the body wash which was to follow. The trees were then white washed as per the formula of A. I. Mason of Hood River, consisting of concentrated lye, rosin, lime, salt and cooked flour starch. This caustic body wash loosens up the callous bark of the trees and assists in preventing the accumulation of insects or fungus diseases of all kinds. This successful fruit grower of Hood River fame admonished us to have no fear of the lye, adding that a can of concentrated lye sprinkled under the branches was worth a dollar in coloring matter to any producing apple tree. In the spring this orchard was deep and thoroughly plowed and then sown to oats and clover. The only crop that year was a satisfactory growth of fruiting wood, thickly studded with splendid fruit spurs, a large amount of improved appearance, a crop of delicious mushrooms and two tons of

hay. The following year, 1908, our hearts were made glad by a bounteous harvest of highly colored, well shaped, but generously punctured apples, which were well sold on the trees.

At this juncture we were indeed fortunate in having our farm accepted as a demonstration farm for spraying apple trees, and Mr. Faurot placed in charge, and we feel that we shall never be able to repay the Department, or the patient, industrious, painstaking man they sent to us, for the valuable help given.

The following years, 1909 and 1910, have been marked by a decided improvement in quality and quantity of apples through the combined methods mentioned. We now have good reasons for much encouragement in our venture and have, we feel, clearly demonstrated the fact that the rejuvenating of old and neglected orchards in Missouri is worth the effort of any industrious and painstaking orchardist.

BODY WASH FOR APPLE TREES.

40 pounds lime, unslacked.
4 pounds rosin.
2 pounds concentrated lye.
5 pounds salt.
4 pounds flour.

Slack the lime, then pulverize the rosin and add lye to it with about two gallons of hot water. Then mix all together, except the flour; make a flour starch out of the flour, and then add it, using enough water with the entire mixture to make a nice thin paste, suitable for white washing.

DISCUSSION.

Mrs. Goode.—I should like to ask if your orchard enterprises have been a financial success.

Mrs. Cox.—I would say that my orchards have paid every expense of the farm this year, including the spraying and other activities of the orchard, together with numerous farm expenses, which are not properly chargeable to the maintenance of the orchard, and in addition a dividend of four per cent upon the investment.

Harry Nelson.—While I am in the fruit growing business, I am not in so much for the profit there is in it as for the recreation and pleasure. My first experience in fruit growing, and as an observer of fruit growing was while I was in the west on the prairies of Nebraska. I have found literature to be useful, but in each place where I have had experience I found that there were special problems, and each one had to be studied by itself. My early observation included the behavior of the wild

prairie plums. In nature these propagated rapidly, and grew so profusely that dense thickets were formed. These trees grew so close together that they did not thrive. It was noticed that when they were thinned out or transplanted to gardens they did much better.

Another experience was in the Ozark Mountains. There I found orchards of apples and peaches growing where nothing but rock was in sight. At that time I could not understand how this could be, but I know more about it now. My next experience was in the far nowthwest. In Idaho I saw unbroken orchards, which were kept like gardens. In the Yakima valley of Washington, people were found who studied nothing else but the question of fruit growing.

Following this, the Grand valley of Colorado was studied. There were to be seen orchards as fine as there were anywhere in the country, consisting of both apples and peaches.

A year or so ago I bought a farm near St. Joseph, and started in in earnest to grow fruit of my own. Many fruit trees were already growing upon the land, but many additional ones were set out. I knew that if these trees were not taken care of that I would lose money in a short time. I generally went out mornings and evenings and had some lively experiences in tending that fruit farm. I first directed my attention toward saving the plum crop, the first fruit that ripened. I had not counted on any profit from this source, as I supposed the fruit would be full of worms. Upon investigation I found that there were large quantities upon the ground, and probably fifty bushels on the trees, but there were no worms.

In marketing, I soon found that the public knows little of varieties. The commission men themselves often know little on this subject. In fact, they know so little that they sometimes ask if certain varieties of peaches are clings or freestones. I further learned that the ladies do most of the buying of fruits from the markets, and these they buy mostly on their good looks. This was particularly true of peaches, and for the most part also with apples.

I tried an experiment in storing both first and second grade Jonathans. I succeeded in selling the first at $2.00, the second at seventy-five cents and the culls at thirty cents per bushel. Before storing, I was offered thirty-three cents and ten cents per bushel, respectively, for the first two grades, but could get no bids on the culls. I built my own storage house, which consisted of a cave, or cellar, and in this I stored a large number of apples. However, the work of building the cellar was done very late, and hurriedly, and the apples were placed in there too warm and did not keep well.

FIG. 5. Apple exhibit made by the Board of Horticulture at the St. Louis Land and Industrial Congress held at the Coliseum Dec. 15-21, 1910.

FIG. 6. A part of the exhibits at the Marionville, Mo., Street Fair and Harvest Show held October, 1910.

I have tried to make a complete study of spraying, whether it is worth while or not, etc. By observation I found out that my Jonathan trees yielded fifteen per cent first quality apples, and the Grimes Golden had only a few number ones, where both were unsprayed. From observation, it soon became clear to me that my loss from not spraying was sufficient to have bought a dozen power spraying outfits. My neighbors who sprayed their orchards harvested from eighty to ninety per cent of first grade apples. I am certain that it is not profitable to keep valuable land in apples without spraying. It would be cheaper to cut them down and devote the land to something else.

DOES IT PAY TO SPRAY?

(By G. W. Hunt, St. Joseph, Mo.)

I fully believe in spraying if you know what you are spraying for. It is absolutely necessary to spray apples in this vicinity. Spraying is like a great many other things, as some people say, they have sprayed but they do not do the work at the right time, and do not do it thoroughly. Years ago, when insects were not so bad, spraying was not so important as now, but the person who does not spray at this stage of the game had better quit the apple business. Many raise almost perfect apples by spraying. Now, a good apple is always salable, but a poor one is an eyesore and hard to realize on successfully. I think if we would take as good care of our orchards here as they do in the west, that we would compare quite favorably with them in the quality of the fruit we would produce. I certainly saw some fruit this season grown here that was sprayed, which would compare very favorably with the western product. However, it will take several years yet for us to learn the business as thoroughly as it is now practiced in the western country, but I believe there are great possibilities here if we will only take hold and learn. I noticed some orchards in this vicinity this past season that were not sprayed. The percentage of faulty fruit in a great many cases was seventy-five and even more. In the sprayed orchards the number one grade would run as high as ninety-five per cent. Spraying this year on the whole made a difference of from sixty to seventy per cent of good fruit. We leased some orchards last year, and what spraying we did proved to be highly successful.

DISCUSSION.

Mr. Bloomfield.—What did you spray with?

Mr. Hunt.—Liquid Bordeaux.

Mr. Darche.—What is the cost of spraying; what does it cost to spray fifteen year old trees?

Mr. Hunt.—I don't know.

F. W. Manville, Boise, Idaho.—I have kept close track of the cost of growing and caring for my fruit trees. The spraying of ten acres of fifteen year old apple trees with a power sprayer with lime sulphur costs $40.00. The Iowa Experiment Station has shown that it costs twenty cents per tree for four sprayings. In the west they use the lime sulphur spray, which costs four to five cents per gallon. Spraying with arsenate of lead can be done at a big profit by charging three and one-half cents per gallon for the solution. It is now known that scale will kill an orchard in five years if not checked. This insect can be absolutely controlled by spraying once a year in late winter with the concentrated lime sulphur solution.

Here in Missouri not enough spraying is done. The spraying materials used in the North Yakima district in one year amount to more than the total consumption in the states of Arkansas and Missouri put together. Last season a few of the growers in the Koshkonong district sprayed their peach orchards with lime sulphur. One grower expected to market a large crop of peaches and had already ordered the cars, but just before ripening, practically the entire crop was swept away by the rot. The money lost on this fruit amounted to about $100,000. Those who sprayed marketed almost a full crop. If you will inquire of the people who are making money in the orchard business, you will find uniformly that they are the ones who give careful attention to spraying.

Mr. Darche.—How many acres a day can you spray?

Mr. Manville.—With a power outfit, I can spray eight acres per day, using eight gallons per tree. Pumps are able to lift and distribute twelve gallons per minute where two lines of hose are at work.

Mr. Stewart.—When is the right time to spray apple trees? When in full bloom?

Mr. Manville.—Spray just before and after blooming.

Mr. Irvine.—I would like to add that Mr. Manville has done most all his spraying where Bordeaux mixture is not in use. In Idaho lime sulphur is used almost exclusively.

PLUMS, AND HOW TO GROW THEM.

(By A. W. Bloomfield, St. Joseph, Missouri.)

I only know about the best plums from my own experience. The best American plum I have ever had is the Wild Goose. This is the best

of all for supplying a local market. It has no superior, and I believe, no equal. It is not a good shipping plum because it is too thin-skinned and tender. Furthermore, the Wild Goose ripens in July when the weather is too hot for successful shipping, but this does not prevent our supplying the local market, and for this purpose it is best of all. The Wild Goose is a strong grower in almost all soils.

I have had some experience with Poole's Pride. The fruit is small in size, but the trees are splendid bearers. The trees make a very good growth, and are stout and strong.

The next variety I shall mention is the Pottawattamie. While this variety is very small, the tree is a prolific bearer. It finds its most congenial home in river bottoms. The Wolf is a good shipper, but the color is bad. It is also rather too late. It does not pay to try to ship very late ripening plums, or at least those that must be harvested when the markets are full of berries. At such times people will not buy plums.

The Damson plum is one that I have had some experience with, and have found it very satisfactory. The Damson is a shy bearer, but sells very well, and is profitable. I have sold Damson plums for from $2.00 to $2.50 per bushel. The Damson plum tree does not make a very large top, and is also very tender and easily affected by frost. The Damson does not bear annually.

The Gold is as hardy as the Wild Goose, but it is not satisfactory for eating out of hand. However, it is largely used for canning purposes, and it also ships well. Some have told me that they liked the canned Gold plum as well as they did peaches.

Of the Japanese varieties, the Abundance stands at the head of the list for quality. Unfortunately, this variety is very bad to rot. When it can be grown it is found to be a better quality than the Burbank. All the Japanese varieties bloom too early.

The Wickson is a better shipper than any of the Japanese sorts, but in quality it is not equal to the Abundance. If I were planting Japanese plums, I would plant only the Abundance and the Wickson.

I have had some experience with the Lombard plums. Some of my trees set and ripened their fruit only twice in sixteen years. The Gages I have never grown. Prunes did no good with me for some reason.

How to Grow Plums.—It is said that plums grow naturally on the banks of streams. This is true of the wild ones. Where plums are grown in cultivation, I think it would be far better to plant them on high ground, as they are too likely to be destroyed by the rot in low places. This is true of all varieties, with the possible exception of the Pottawattamie.

In setting the trees, I should advise planting several varieties closely adjacent to each other. This is for the purpose of securing better pollination. It is well-known that many plants have to be cross-pollinated before they will bear fruit. This is especially true of the Wild Goose plum, which can not be fertilized with its own pollen. If several varieties are grown in the same orchard they will be sure to furnish pollen for each other. In order for two trees to cross-pollinate, they must blossom at the same time, and ripen their pollen together. In planting trees, do not set out suckers or sprouts from the roots of the trees. It is far better to buy nursery grown trees, that is, budded stock. It is better still to have them budded upon peach roots. My experience has taught me that it pays to have all my plums on peach stock.

THE LATEST METHODS FOR SPRAYING APPLE TREES.

(By Dr. C. R. Woodson, Agency, Missouri.)

I am a firm believer in the necessity of spraying apple trees. The fact is if you don't spray you had as well go out of the business. The value of apple spraying has been demonstrated thoroughly, both in the west and in the east, and now is being demonstrated in the middle west. Unfortunately, our growers here in the middle west have been slower in taking up spraying than they should have been, as they are also slow in undertaking other matters on a large scale. In times past I have been damaged very greatly by the work of insects. Finally, I began spraying and last year, on my sprayed trees the fruit graded ninety-seven and one half per cent perfect. I am a believer in the use of the power spraying outfits. I do not believe the hand outfits now on the market are powerful enough to do perfect work. I don't believe it is possible to spray the tops of the trees properly without using a platform. I am not an advocate of any particular machine. Any reliable house can put out a good sprayer. I think the trouble with the majority of the spraying machines is that the engines are too small, and not powerful enough. The gasoline we get is not what it should be, but perhaps it is the best there is. The compressed air outfits are claimed to be the best things out, but they are too expensive. In spraying, the work should be done very thoroughly. Every leaf should be covered, and the interior of the trees should be wet, so that there will not be a dry twig or leaf, or even a dry trunk in the field.

I think it is well worth while to spray the orchard while the trees are dormant, say in November and March. Sometimes we have some fine

bright weather in February, when the spraying may be done. It is said the nicest time to spray is just before the buds burst. Now, if we knew just exactly what the weather was going to be like, this would be just the thing to do, but we can't tell what kind of weather we will have, say ten days in advance, or even ten hours, before the buds open. When a lot of spraying is to be done, it is better to begin two weeks before the buds open than not to spray at all. I would use Bordeaux mixture in the late fall and early spring sprayings. I think it would be particularly efficacious when used in February or March. It is also very important to spray the trees after the petals have dropped, and before the calyx closes. When this application is made after the petals have dropped the little fruits are then standing upright and the calyx ends are surmounted by a mass of bristling stamens. We want the spraying mixture to penetrate in among these stamens, and to accomplish this, it is necessary to do our spraying from a high platform, and direct the spray downward into the upstanding calyx. Poison must be added at this spraying, as this is the time to kill the codling moth and the curculio. There should be two crews of men, one upon the platform to spray the tops of the trees, and those from below, who will attend to the lower branches.

My experience with the liquid sprayings has given me better success than the dry. If there is sufficient moisture that the dust spray will be changed into a dough, that may be all right, but there are so many times when there is no moisture, and if we try to apply the dust spray at night it will be much harder for the men to handle the material. One man said of the dust sprayer, "I am not going to run that thing any more, as I got more of that stuff in my lungs, nose and eyes than I did on the trees." However, either wet or dry, if the work is thoroughly done there will be good results. The thing to do is to spray at the right time, and to spray thoroughly. Have your solutions well mixed, keep your orchard clean, and you will raise good apples.

DISCUSSION.

Mr. Maxwell.—I have known Dr. Woodson all my life, and what he has said in his practical talk I wish to endorse from beginning to end. I have had quite an extensive experience in the orchard business. I commenced forty-two years ago, and have studied practically every phase of spraying. People are becoming interested in fruit growing, and they have come to the point where they realize that they have got to use all their own intelligence, together with all the information that can be gleaned from every horticultural worker. No man is successful in life who does not give his business his very best thought. I have been spray-

ing for nineteen years. I used the 4-4-50 Bordeaux formula for seven years, and I don't want to say any thing against the good work and effectiveness of the liquid sprays. However, after seven years' experience, I decided that I had had enough of the liquid, and so began to try the dry spray, and I have been using that ever since with decided success. I divided my orchard into blocks of ten acres each, and sprayed with the dry and liquid sprays. These trials convinced me that the dust was better than the liquid.

When I first commenced spraying I made my own dust, and so did a great many other people. I now use a dust made in Kansas City by a dust spraying company. I finally worked out my own dust formula, which I believe has never been surpassed. With dust, I can control the codling moth as well as the diseases if the weather is reasonably dry. I use three pounds of sulphur to five pounds of hydrated lime. Next year I expect to use the sulphur and lime in equal quantities. I use Paris green to kill the insects, at the rate of one pound of the poison to fifteen pounds of lime.

After heavy rains, all kinds of sprays, whether dust or liquid, are washed off. After a heavy rain, with the dust outfits, we can begin spraying at once, as they are light, and can be taken through the orchard even though the ground be soft. The cost of dusting my orchard was nine cents per tree for the season.

In closing, I wish to say that I endorse the liquid spraying thoroughly, as well as I do the dust. There should be a law compelling everybody to use one or the other, as everybody ought to be made to spray his trees with something.

COMMON SENSE APPLIED TO FRUIT GROWING.

(By F. W. Dixon, Holton, Kansas.)

It does not require common sense to make a success of fruit growing, but uncommon sense. Now, in reading some of the catalogues, they would have us believe that the only road to success is to buy plants from that particular house. Such is not the case, however, but the main thing with us has been to cope with the weather conditions. We have suffered more from unusual weather extremes than from all other causes put together. I am a strawberry specialist, and have learned that any kind of ground will grow at least some of the varieties of that berry, but not all of the kinds will succeed on the same ground. With good weather conditions, almost all varieties will succeed in certain seasons and fail in others, but every fruit grower must work out his own salvation. I have been

growing fruit for thirty years, and the more I learn about the business the more I see that I do not know.

After I had grown strawberries for a number of years I was much impressed by what I read about the great apple orchards, and what bonanzas they were. I thought all I had to do was to plant an orchard and reap a rich harvest. I have learned a great deal about apple growing since then. I have learned that it is one thing to plant an orchard and quite another thing to be able to pick big crops of fruit therefrom. As I stated before, I am not sure that I know much about the business yet.

I have been spraying for about twenty years. The first year I sprayed I killed nearly all the trees that I treated, and therefore, quit spraying for a time. However, I soon learned that I had to either spray or give up fruit growing entirely, and so I set to work and learned to spray right, and I have proven to my own satisfaction that spraying pays well.

The main thing that we fruit growers usually discuss is how to grow more fruit. If the fruit growers would discuss how they could get more for the fruit they grow they would be better off. I know of a car of Elberta peaches that sold in our town for seventy-five cents per bushel, but the consumers of that fruit had to pay $3.00 per bushel. Now, the only way in which the farmer is likely to remedy this state of affairs is to use a little common sense, but possibly it will have to be called uncommon sense. I am not prepared at this time to state exactly how the producer is to get more of the consumer's dollars, but he certainly needs a larger share than he gets now. I believe the remedy lies in getting together. Use common sense by organizing and sticking together until the question is solved.

I have twenty-seven Winesap apple trees growing in the middle of a Ben Davis orchard. This year they produced a net profit of $500.00. Two years ago they did the same. The best of these apples sold for $1.50 per bushel f. o. b. cars. These trees have been sprayed for several years with Bordeaux mixture, but the past season we sprayed with lime sulphur. Lime sulphur will not kill the apple blotch, and on this account I lost two cars of apples from this disease in the middle of my Ben Davis orchard. Winesaps are not subject to the blotch disease, so I did not lose any of this variety.

I have used orchard heaters for some time, and I know they are a good thing. I have succeeded in raising the temperature as much as six degrees. By using one hundred heaters to the acre, the temperature can be raised as much as ten degrees. The expenses of heating are not very

great compared with the profits derived by saving a crop. Eighty to one hundred heaters per acre will cost about $20.00. I believe the heaters would be a profitable investment for strawberry fields. I tried forty heaters per acre for my strawberries, but found the number insufficient. I found that flooding the strawberry field with water was an effective remedy against frost.

DISCUSSION.

J. H. Murray.—As a class, I think fruit growers have plenty of common sense and good judgment, but some of them fail to make use of their talents. A great many people will take fine care of their orchards while they are young, but if they do not begin bearing as soon as they think they should, the trees are neglected. The orchard is allowed to go without pruning, spraying and cultivation, and the weeds have full sway. These people then condemn the fruit business, and cut their orchards down. I do not believe in neglecting any of these things. We should keep our orchards clean, either by cultivating or by turning in hogs or calves. After the trees are in full bearing these animals will not hurt them. The hogs will get the fallen apples and will make good gains by what would otherwise be wasted. The apples that remain to be harvested will then be of much better quality. I prefer red hogs, as they are more prolific and are also good hustlers. I have been in a good many orchards this fall and always found the apples of better quality where the orchards had been kept clean, and where the trees had been sprayed. If we take good care of our orchards year after year, we will succeed in the end.

PREMIUMS AWARDED.

The committee appointed to judge the fruit exhibit, reported the following awards:

Best five plates of Ben. Davis:	
First, J. R. Wilson, DeKalb	$2.00
Second, W. J. Wilson and W. D. Maxwell, St. Joseph	1.00
Best five plates of Gano:	
First, J. R. Wilson, DeKalb	2.00
Second, W. J. Wilson and W. D. Maxwell, St. Joseph	1.00
Best five plates of Jonathan:	
First, J. R. Wilson, DeKalb	2.00
Second, W. J. Wilson and W. D. Maxwell, St. Joseph	1.00
Best five plates of York Imperial:	
First, Peter Nedelec, St. Joseph	2.00
Best five plates of Winesap:	
First, J. R. Wilson, DeKalb	2.00
Second, W. J. Wilson and W. D. Maxwell, St. Joseph	1.00

Best plate of Ben Davis:	
First, J. R. Wilson, DeKalb	1.00
Second, W. J. Wilson and W. D. Maxwell, St. Joseph	.50
Best plate of Gano:	
First, J. R. Wilson, DeKalb	1.00
Second, W. J. Wilson and W. D. Maxwell, St. Joseph	.50
Best plate of Jonathan:	
First, J. R. Wilson, DeKalb	1.00
Second, W. J. Wilson and W. D. Maxwell, St. Joseph	.50
Best plate of Grimes Golden:	
First, W. J. Wilson and W. D. Maxwell, St. Joseph	1.00
Best plate of Mammoth Black Twig:	
First, J. R. Wilson, DeKalb	1.00
Second, Dr. J. M. Austin, St. Joseph	.50
Best plate of Huntsman:	
First, J. R. Wilson, DeKalb	1.00
Second, W. J. Wilson and W. D. Maxwell, St. Joseph	.50
Best plate of Missouri Pippin:	
First, W. J. Wilson and W. D. Maxwell, St. Joseph	1.00
Best single plate of York:	
First, W. J. Wilson, St. Joseph	1.00
Second, R. E. Lee Utz, South St. Joseph	.50
Best plate of Winesap:	
First, J. R. Wilson, DeKalb	1.00
Second, W. J. Wilson and W. D. Maxwell, St. Joseph	.50
Best plate of Stayman Winesap:	
First, W. J. Wilson and W. D. Maxwell, St. Joseph	1.00
Best plate of Geniton:	
First, Dr. J. M. Austin, St. Joseph	1.00
Second, J. R. Wilson, DeKalb	.50
Best plate of Rambo:	
First, W. J. Wilson and W. D. Maxwell, St. Joseph	1.00
Best plate of Arkansas Black:	
First, W. J. Wilson, St. Joseph	1.00
Second, W. D. Maxwell, St. Joseph	.50
Best plate of Rome Beauty:	
First, W. J. Wilson and W. D. Maxwell, St. Joseph	1.00
Second, W. D. Maxwell, St. Joseph	.50
Best plate of Wealthy:	
First, W. J. Wilson and W. D. Maxwell, St. Joseph	1.00
Best plate of Smith Cider:	
First, J. R. Wilson, DeKalb	1.00

SUMMER APPLES.

(By H. A. Squires, St. Joseph, Mo.)

The growing of summer apples in this district, and perhaps throughout Missouri, is a neglected industry. Every one seems to have gotten the idea that summer apples have to be harvested at a busy time and sold quickly in order to save them. Moreover, so few people are growing them that it is not well known that prices for summer apples are generally quite high. Not knowing this, and looking only at the possible trouble it would be to harvest and market quickly, most people have been deterred

from growing summer varieties. To the average mind, it looks so much easier to grow the winter apples. These have quite a long season during which they may be harvested, and then after that they will keep a long time if a buyer is not found immediately.

The facts of the business are that summer apples are a better paying proposition than the winter sorts, particularly for many people. The time was when summer apples did not pay, but now they sell well, and the market will take a lot of them. One chief advantage in growing summer apples is that they do not have to be sprayed as many times as the winter sorts, for the reason that they are harvested at a time when we are still spraying the winter varieties. The summer apples are all gathered before the second brood of the codling moth comes on, and, therefore, these worms do not do so much injury as they do to the fall and winter apples.

In the southern part of the State where the bitter rot is often very bad, the summer apples would be apt to escape that disease entirely. While a few varieties of the summer apple trees sometimes blight, they are no worse than the winter sorts in this respect, and, therefore, this ought not to keep people from growing the summer kinds. While there are certain varieties that would be much better for selling than others, there are many places where a local market will take almost anything in the way of apples in the summer. The city markets know a few particular varieties only, and it would be much better for the grower to try to give them what they want. If summer apples are grown on a small scale, and are to be sold locally, then a man can grow what he likes himself, and after using what he wants, easily dispose of the remainder, but if he is going to grow them to ship in car lots, then he must grow certain standard varieties that the big markets want. This is a reason for not mixing the varieties too much. For this reason, too many varieties should not be grown by the same man unless he has enough of each kind to load a car. This could be partially overcome by several farmers agreeing to grow an acre or two of the different kinds. By working together these people could always load a car on any particular day by combining their product.

Summer apples could be advantageously grown in a community where strawberries or peaches, or both, have been the main crops. Strawberry and peach growers are in the habit of working through associations. In a community where there is an association which sells a strawberry or peach crop, the same machinery of organization could be used to good advantage for harvesting, packing and marketing the summer apples. Summer apples are more perishable than the winter sorts,

which makes it more necessary to have more perfect facilities for handling the crop.

Varieties.—I believe the Duchess to be the best summer apple, although it is not the one I have made the most money out of. The Duchess is a very fine apple, but it does not sell well on a local market. The Duchess is not a good eating apple, being too sour, but it is splendid for cooking. It is a good shipper, and this is the principal variety that is desired by the northern markets.

I have made my best money out of the Yellow Transparent. This is the best of all for a local market. On this account I put out an orchard of two hundred and fifty trees of the Transparent, and at home they sold much better than the Duchess. I have sold as many as thirty bushels of Transparents from a single tree, receiving for them from $1.10 to $1.25 per bushel. The Yellow Transparent is not only good for cooking, but it is liked by most people for eating purposes. This is the best selling variety I have ever found for the St. Joseph market. Sometimes there is complaint about blight with this variety, but I can say that I have not seen a trace of this disease among my trees for twenty years. While the Transparent is good for eating and cooking, it is not a very good shipper. I sold two car loads of this variety in Illinois. In the first car were one hundred barrels of barreled apples, one hundred and twenty-five barrels of bulk apples, and two barrels of cider. The better grade of barreled apples sold for $3.50 per barrel, and the bulk at from $1.10 to $1.25 per barrel, and the cider at forty cents per gallon. This car went to Astoria, Illinois. The second car was shipped to Browning, Illinois. One-half of that car was sold in Browning, and the other half in Rushville. In this second car I had one hundred barrels of the good fruit and one hundred and seventeen barrels of the bulk. The prices secured were the same as those for the first car. The bulk apples referred to were some that a buyer had rejected, and I was forced to handle them myself, but by so doing, I made more money out of them than I did out of my first-class apples.

Since my orchard of Yellow Transparent has been in bearing I have sold twenty cars of fruit. The total value of this fruit was about $21,000.00.

The Wealthy, in Northwest Missouri, we have to class among the fall apples. It is a splendid variety for its special season. There is no better apple to make money out of. Out of an orchard of less than twenty-two acres I sold $6,000.00 worth of apples. The Wealthy would be much earlier in ripening in Southern Missouri.

A new variety of summer apple that is now being tried in many

places is the Liveland Raspberry. This is of the Yellow Transparent type, but is said to be a very great improvement over that variety. Mr. Hitt, president of the Board of Horticulture, has planted some of this variety in his orchard in Southern Missouri, and I know of several others who are planting on a small scale.

Other summer varieties are the Red June, Early Harvest and Keswick Codlin. Locally, perhaps, any of these would sell. The Red June comes into bearing reasonably young, and the fruit ripens rather early in the season. The Keswick Codlin is a good green colored cooking apple. The Early Harvest does not begin bearing until it is ten or twelve years old. In St. Louis county, Mr. Linss of Chesterfield, grows the Early Harvest, Wealthy, Sherwood, Wolf River, Pennsylvania Red Streak, Red June, Red Astrachan and the Yellow Transparent. The Early Harvest he finds to be the earliest to ripen, but it is a poor keeper and must be shipped quickly. The Wealthy with him is a splendid keeper, and while it ranks as a summer apple, it will keep until late fall. The Sherwood is similar to the Wealthy, but is not so good an eating apple. The Wolf River is a very coarse, large apple, which rots easily, and must be marketed quickly. It sells well on account of its large size. The Early June is a favorite with many because it is good for eating and cooking, and is a very good keeper. The Yellow Transparent is perhaps the most beautiful of all and sells very well indeed. It is good for both cooking and eating. The Red Astrachan is very acid, but has good cooking qualities. It comes in after the Early Harvest.

For South Missouri probably the most promising summer apple is the Benoni. In general appearance this variety is splashed with red over a yellow ground color. It is excellent for eating and also cooks well. The best feature of the Benoni is its hardiness of bud. It is quite resistant to cold and also blooms late in spring, like the Ingram. In its certainty of bearing, it is as sure as the Ingram. Like the Ingram, it is quite apt to overbear, and must be pruned heavily each winter. Another good quality is its long season of ripening. They may be harvested over a period of three weeks or all at once.

FIFTY-THIRD ANNUAL MEETING

OF THE

Missouri State Horticultural Society

AT COLUMBIA.

ARE THE SPRINGS COLDER NOW?

A paper on "Late Spring Frosts in Relation to the Fruit Crop of Missouri."
(By George Reeder, Section Director, U. S. Weather Bureau, Columbia, Mo.)

The frequent and heavy losses suffered by Missouri fruit growers from late spring frosts during the last ten years have created some alarm among orchardists and have caused a few to question the policy of attempting the raising of fruit in this State on an extensive commercial scale. It is asserted by many that the climate of Missouri has changed; that our winters are milder and our springs are colder than formerly.

OPINION WIDESPREAD.

The assertion that our climate has changed, and for the worse, is not confined to Missouri alone by any means. Indeed, east of the Rocky Mountains the opinion that the climate is undergoing an appreciable change, is general, especially among the agriculturists. The man who is the closest to nature always has been quick to note weather changes, and while many of his sayings and signs are not worthy perhaps to be handed down from father to son, still there are a few not to be altogether despised or thrown aside.

It is, of course, not an easy matter to compare the losses in fruit culture of 20 or 30 years ago with those occurring to the industry as carried on today. During the first decade of the 30 years ending with the spring of 1910, there were few, if any, so-called commercial orchards in Missouri. While every farmer possessed an orchard for home use, they were, as a rule, composed of many varieties of trees that blossomed at different times. It was, no doubt, a rare occurrence indeed, owing largely to this difference in the blossoming time, when there was not sufficient fruit from some variety for home consumption. On the other hand, in

the present day of the large commercial orchards, the varieties maintained in any one orchard may be counted on the fingers of one hand, and consequently the almost total destruction of fruit from late spring frosts has become more frequent.

THE SPRINGS APPEAR TO BE COLDER NOW.

Notwithstanding the supposition that orchards may be more liable to injury from late spring frosts at the present time because in many cases almost the entire orchard blossoms at the same time, or to the improved strain of fruit now grown (the latter statement is much in doubt, many authorities claiming that improved fruit is not more sensitive to cold than the varieties grown 30 years ago), the fact remains that the springs of the last ten years, and particularly the last five years, averaged colder than those of the preceding 10 or 15 years, and this statement is well supported by climatological data, presented here, possibly for the first time, in apparent substantiation of the popular idea that "our climate has changed." I would, however, earnestly caution the reader not to be too hasty in the conclusion from data here presented that the climate of Missouri is undergoing a permanent change. Meteorologists of the world generally agree, and the world's climatological records show, that climate is practically unchangeable; that is to say, permanent climatic changes are noticeable, probably, only in geological units of time. On the other hand, the records also indicate that while weather may change from day to day or from hour to hour, there are certain changes that move in cycles or oscillations, having uncertain units of time. The cause of these cycles or oscillations is not definitely known, but it has been pointed out by one or two authorities that the wet and cool periods and the dry and warm periods on the earth appear to correspond somewhat with the periods of maximum and minimum sun spots, which in turn are thought to be due to changes in the sun's photosphere. A few students of the subject claim that these weather changes go in cycles of three years, then a longer one of about nine or eleven years, and still a greater cycle of thirty to thirty-five years, the last being more clearly pronounced; but no general agreement has yet been reached regarding them.

DAILY MINIMUM TEMPERATURE IMPORTANT FACTOR.

Studies of the mean daily, mean monthly, and mean annual temperatures, while important in themselves, give us a nearly unchangeable factor, and one not particularly interesting or striking in its features. For instance, the variations in the mean annual temperature of Missouri,

covering a period of 25 years or more, rarely exceed 3 degrees and are often less than 1 degree. It matters not what the extremes may have been during the four seasons, or 12 months, at the close of each 365 days the final value is practically the same year after year. Another example in which the mean temperature gives but little satisfaction as to the variations in the weather that have taken place during a certain period is that for April, 1910, which, for the State of Missouri, differed from its 20-year normal by only 0.3 degrees. Yet the frosts of that month were the most destructive from the viewpoint of the agriculturist and horticulturist, and the weather generally was the most disagreeable from the physiological side that has occurred during, possibly, the past 30 years.

The factor that is the most important, in my opinion, is the daily minimum temperature, which is, as a rule, nothing more than the lowest night temperature. The night temperatures explain the interesting cause why the crops do not grow and why the season is delayed. The days may be warm and bright, but vegetation as a rule will not flourish as long as the nights continue abnormally cold.

The present paper presents graphically in figure 7 the average daily minimum temperature, by decades, recorded during April and May, at Columbia, Boone county, Missouri, during the 20 years, 1891 to 1910, and in figure 8, the last date on which a temperature of 32 degrees F. occurred during the 30 years, 1881 to 1910, at Mexico, Audrain county, and the 20 years, 1891 to 1910, at Columbia. Tables numbered I and II are also presented, showing daily minimum temperatures of Columbia for the two mentioned spring months, and also Tables III and IV, which give the dates of the last killing frost (32 degrees F.) at both places for the entire period under discussion.

The data for Columbia have been used for the reason that at this station self-recording instruments have been in use continuously during the entire 20 years, covering a longer continuous period with self-recording thermometers than any other station in the State outside of the larger cities. Its situation is at a moderate elevation (738 feet above mean sea level) and near the center of the State. It is remarkably free from local temperature control, and the climatic values also closely agree with the average values for the entire State. While the length of time covered by the tables is not sufficient to justify exact conclusions in regard to temperature oscillations, it is sufficient for a comparison of two ten-year periods. The data for the first eleven years at Mexico, Mo., in figure 8, were taken from the dry-bulb thermometer readings at or near 7 a. m., supported by annotations on killing frosts, ice, etc., made at the time by the observer; they are, therefore, perhaps not strictly comparable

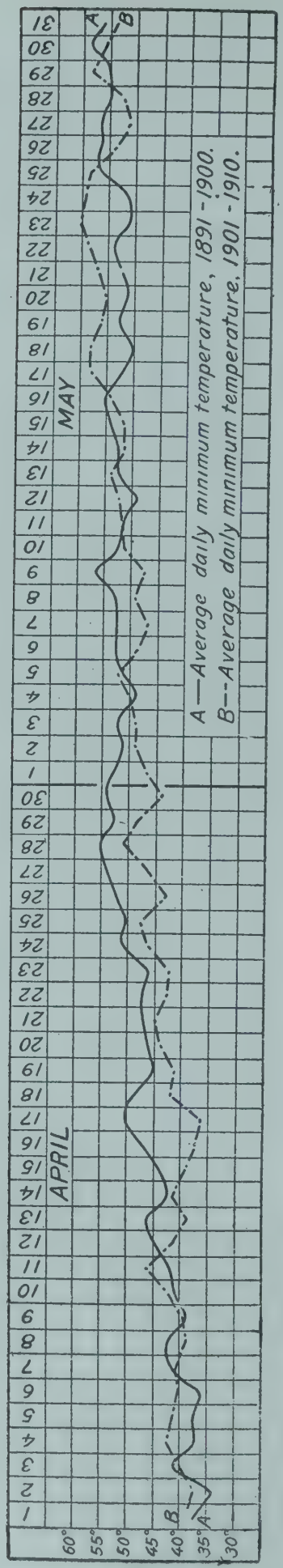


FIG. 7. Table showing average daily minimum temperatures for the two decades 1891 to 1900 and 1901 to 1910. Note that the solid line A, has reference to the first decade and the broken line B, to the second decade.

with the last 19 years which were obtained from self-recording instruments.

It requires but a casual inspection of figure 7 to note that the mean minimum temperature at Columbia, Mo., during the last 10 years, indicated by the broken line marked "B," is lower than the preceding ten years, as shown by the solid line marked "A." Particularly is the difference noticeable from April 12 to May 10—the period when fruit is in its most critical stage. Now, if we refer to Table I, we shall find that for April the 10-year averages are as follows:

1891-1900 ..... 45.0 degrees
1901-1910 ..... 42.0 degrees

These figures show the second decade to have been 3 degrees colder than the first.

TABLE I.

DAILY MINIMUM TEMPERATURE, COLUMBIA, MO., 1891-1910 (APRIL)
FIRST DECADE.

	April.															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1891	31	32	28	27	22	30	30	40	51	43	35	47	56	52	48	48
1892	56	43	54	56	39	33	42	35	28	33	39	34	42	33	26	45
1893	43	38	55	51	53	56	70	52	39	42	48	53	44	30	28	43
1894	34	36	54	40	32	33	50	40	42	34	30	33	41	48	48	53
1895	38	33	32	39	56	46	42	42	40	44	52	56	41	40	53	46
1896	30	29	21	32	42	46	43	43	40	53	62	58	54	50	63	68
1897	43	45	50	43	43	36	35	40	35	41	31	46	44	38	39	37
1898	40	32	43	36	26	21	25	42	39	42	35	47	39	38	35	44
1899	21	24	26	18	28	27	34	33	28	41	59	45	60	48	40	29
1900	34	33	44	30	33	37	42	51	42	33	28	31	35	41	51	54
Average.	37.0	34.5	40.7	37.2	37.4	36.5	41.3	41.8	38.8	40.6	41 9	45.0	45.6	41.8	43.1	46.7

	17	18	19	20	21	22	23	24	25	26	27	28	29	30	10-year mean.
1891	55	50	60	62	59	57	48	49	48	49	52	46	49	59	.....
1892	54	46	41	43	43	41	33	37	47	54	63	50	35	49	.....
1893	41	51	51	34	33	33	26	43	42	49	38	48	45	45	.....
1894	62	57	49	39	38	33	35	45	47	54	56	60	65	62	.....
1895	39	37	38	48	50	41	49	50	57	57	53	55	60	60	.....
1896	67	58	51	65	53	52	59	60	60	60	57	71	60	52	.....
1897	29	45	35	36	50	66	56	62	59	51	52	56	48	44	.....
1898	58	54	41	40	47	54	50	44	40	41	42	50	43	55	.....
1899	46	46	43	49	44	49	47	47	46	59	68	58	64	65	.....
1900	50	47	42	51	51	44	57	58	54	54	57	56	51	50	.....
Average.	50.1	49.1	45.1	46.7	46.8	47.0	46.0	50.5	50.0	52.8	53.8	55.0	52.0	54.1	45.0

SECOND DECADE.

	April.															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1901.....	30	33	30	40	37	38	38	38	38	48	46	47	47	45	40	44
1902.....	30	28	38	34	36	44	32	26	37	35	39	35	37	42	38	32
1903.....	54	45	32	29	45	49	40	38	46	58	56	53	41	39	39	42
1904.....	44	37	29	31	40	36	43	31	35	31	44	36	33	32	35	29
1905.....	54	48	54	39	33	31	31	42	49	45	43	34	35	36	32	29
1906.....	31	37	50	50	45	36	49	50	45	39	48	57	45	39	34	34
1907.....	32	38	48	50	37	35	42	36	32	29	36	32	27	27	42	32
1908.....	32	26	24	41	45	42	56	42	38	51	40	37	47	57	46	37
1909.....	30	27	38	45	59	43	36	31	27	27	47	36	30	41	39	54
1910.....	41	47	56	56	33	43	37	54	46	52	57	47	45	55	47	33
Average.	37.8	36.6	39.9	41.5	41.0	39.7	40.4	38.8	39.3	41.5	45.6	41.4	38.7	41.3	39.2	36.6

	17	18	19	20	21	22	23	24	25	26	27	28	29	30	10-year mean.
1901.....	34	31	34	35	33	38	45	41	53	58	60	59	55	53	.....
1902.....	40	49	45	50	70	47	39	43	49	45	41	54	53	53	.....
1903.....	35	49	50	51	42	37	33	48	40	30	44	57	53	34	.....
1904.....	27	40	35	32	32	46	57	56	41	40	37	39	40	47	.....
1905.....	26	30	38	57	42	36	43	50	55	53	48	55	46	43	.....
1906.....	44	48	48	55	49	48	45	50	58	50	61	55	51	54	.....
1907.....	28	38	37	33	29	40	41	50	39	35	41	52	39	35	.....
1908.....	46	52	48	55	59	59	62	57	54	41	36	35	37	28	.....
1909.....	53	46	42	40	45	40	35	40	50	44	44	43	51	36	.....
1910.....	30	33	33	29	48	40	28	27	32	37	46	57	64	56	.....
Average..	36.3	41.6	41.0	43.7	44.9	43.1	42.8	46.2	47.1	43.3	45.8	50.6	48.9	43.9	42.0

In Table II for May the averages are:

1891-1900 ..... 53.0 degrees
1901-1910 ..... 53.0 degrees

This shows no difference for the whole month; but if we take the first 15 days of May of the first 10 years and compare them with the first 15 days of the last ten years, we find that the latter period was 2.6 degrees colder than the first, as shown in the following table:

First 15 days of May, 1891-1900..... 51.9 degrees
First 15 days of May, 1901-1910..... 49.3 degrees

For further comparison other near-by stations having records from self-registering instruments for nearly the entire periods under discussion are entered here, the mean monthly minimum temperature being given:

	April.	May.
Mexico:	°	°
1891-1900	43.9	53.6
1901-1910	40.2	51.7
Fayette:		
1891-1900	45.6	54.3
1901-1910 (May, 1907, out)	41.5	52.4
Harrisonville (in western part of State):		
1891-1900	43.6	53.5
1901-1910	40.6	52.4

TABLE II.

DAILY MINIMUM TEMPERATURE, COLUMBIA, MO., 1891-1910 (MAY). FIRST DECADE.

	May.															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1891	43	49	49	46	44	32	36	45	54	46	43	39	51	45	49	50
1892	63	65	58	50	54	50	47	44	54	45	47	35	51	59	55	49
1893	44	34	41	48	58	45	43	50	51	56	64	52	48	58	53	45
1894	58	46	60	53	57	62	52	50	60	53	42	50	58	63	65	68
1895	64	60	66	64	60	61	58	58	63	62	43	38	48	33	45	44
1896	58	49	49	56	58	62	60	61	65	64	65	66	60	56	49	58
1897	40	38	48	40	45	52	55	59	60	46	59	46	48	40	42	47
1898	59	53	51	46	42	39	40	40	50	55	51	49	50	54	59	56
1899	59	61	55	41	44	56	61	55	54	58	45	62	50	56	64	69
1900	45	52	40	48	48	59	63	59	45	37	55	57	63	65	59	60
Average	53.3	50.7	51.7	49.2	51.0	51.8	51.5	52.1	55.6	52.2	51.4	49.4	52.7	52.9	54.0	54.6

	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	10-year mean.
1891	44	49	55	62	54	58	52	50	56	47	40	39	45	50	61	.....
1892	60	52	50	42	37	35	38	47	58	55	44	56	54	63	61	.....
1893	43	42	60	55	61	65	45	46	55	57	51	50	50	58	58	.....
1894	67	47	37	36	47	46	45	49	53	51	57	43	51	53	38	.....
1895	35	39	43	45	42	43	44	50	59	49	50	65	66	68	67	.....
1896	55	65	63	59	67	63	63	67	74	64	63	52	48	63	57	.....
1897	52	55	55	60	57	59	56	46	40	54	59	61	47	51	39	.....
1898	57	60	63	60	59	56	56	58	62	57	64	60	63	58	57	.....
1899	52	43	52	49	53	56	50	46	55	65	68	62	63	61	59	.....
1900	60	48	48	43	44	55	59	55	56	59	62	65	64	64	64	.....
Average	52.5	50.0	52.6	51.1	52.1	53.6	50.8	51.4	56.8	55.8	55.8	55.3	55.1	58.9	56.1	53.0

SECOND DECADE.

	May.															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1901.....	54	58	63	62	59	52	50	50	53	46	46	45	34	41	47	60
1902.....	60	65	68	61	60	57	47	48	55	55	48	57	63	60	52	57
1903.....	30	41	37	40	49	49	53	57	58	55	61	60	59	59	57	55
1904.....	52	50	51	55	58	58	60	52	45	45	54	53	46	45	43	50
1905.....	53	59	66	59	50	54	44	52	52	71	54	44	58	53	49	48
1906.....	58	56	48	54	49	36	33	40	31	44	58	59	62	60	61	64
1907.....	32	38	35	28	41	41	50	53	46	54	38	54	64	44	36	40
1908.....	39	33	42	49	49	44	46	43	42	50	60	57	62	60	56	60
1909.....	31	36	41	47	60	48	41	53	42	37	42	49	59	64	53	47
1910.....	53	43	42	42	43	46	45	44	46	54	52	44	37	39	50	51
Average..	46.2	47.9	49.3	49.7	51.8	48.5	46.9	49.2	47.0	51.1	51.3	52.2	54.4	52.5	51.4	53.2

	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	10-year mean.
1901...	61	59	59	50	48	47	64	50	47	38	42	49	48	50	46	.....
1902...	67	72	65	70	67	62	63	62	59	52	48	46	51	57	61	.....
1903...	63	64	59	59	61	70	62	66	62	68	60	55	61	52	50	.....
1904...	48	44	48	48	51	62	64	59	63	54	48	54	61	59	55	.....
1905...	49	46	49	54	55	59	52	49	53	44	57	60	66	58	56	.....
1906...	65	65	55	49	51	58	63	66	64	65	47	45	46	66	65	.....
1907...	55	66	54	47	46	59	63	64	65	46	40	41	50	56	53	.....
1908...	65	60	56	63	62	52	63	71	66	69	60	60	60	56	53	.....
1909...	53	55	59	52	50	55	51	54	55	53	52	54	62	57	54	.....
1910...	51	44	54	60	65	59	55	49	46	54	53	56	62	52	47	.....
Average	57.7	57.5	55.8	55.2	55.6	58.3	60.0	59.0	58.0	54.3	50.7	52.0	56.7	56.3	54.0	53.0

This comparison shows that the month of April, during the last ten years, averaged 3.6 degrees colder than the preceding 10 years, and that May was 1.7 degrees colder during the last decade.

A closer inspection of Table II will show the interesting fact that during the first 10 years the temperatures during the first 15 days of May registered in the thirties 10 times, reaching 32 degrees once, and during the last 15 days they were in the thirties 9 times. During the first 15 days of the last ten years the number had increased to 18, reaching 32 degrees or lower 5 times; during the last 15 days of the last 10 years, however, the temperatures were in the thirties but once.

We shall find that there is a close agreement between the tables and curves. For instance, an examination of figure 7 will disclose the fact that during the period from 1891 to 1900 danger from frost was practically over by the 15th of April, but during the last decade the probability of damaging frosts had been extended into May.

Now, along with figure 7 let us inspect figure 8. From this chart we find that during the period represented by the years 1881-1890, at Mexico, there was but one killing frost after the 20th of April; during the follow-

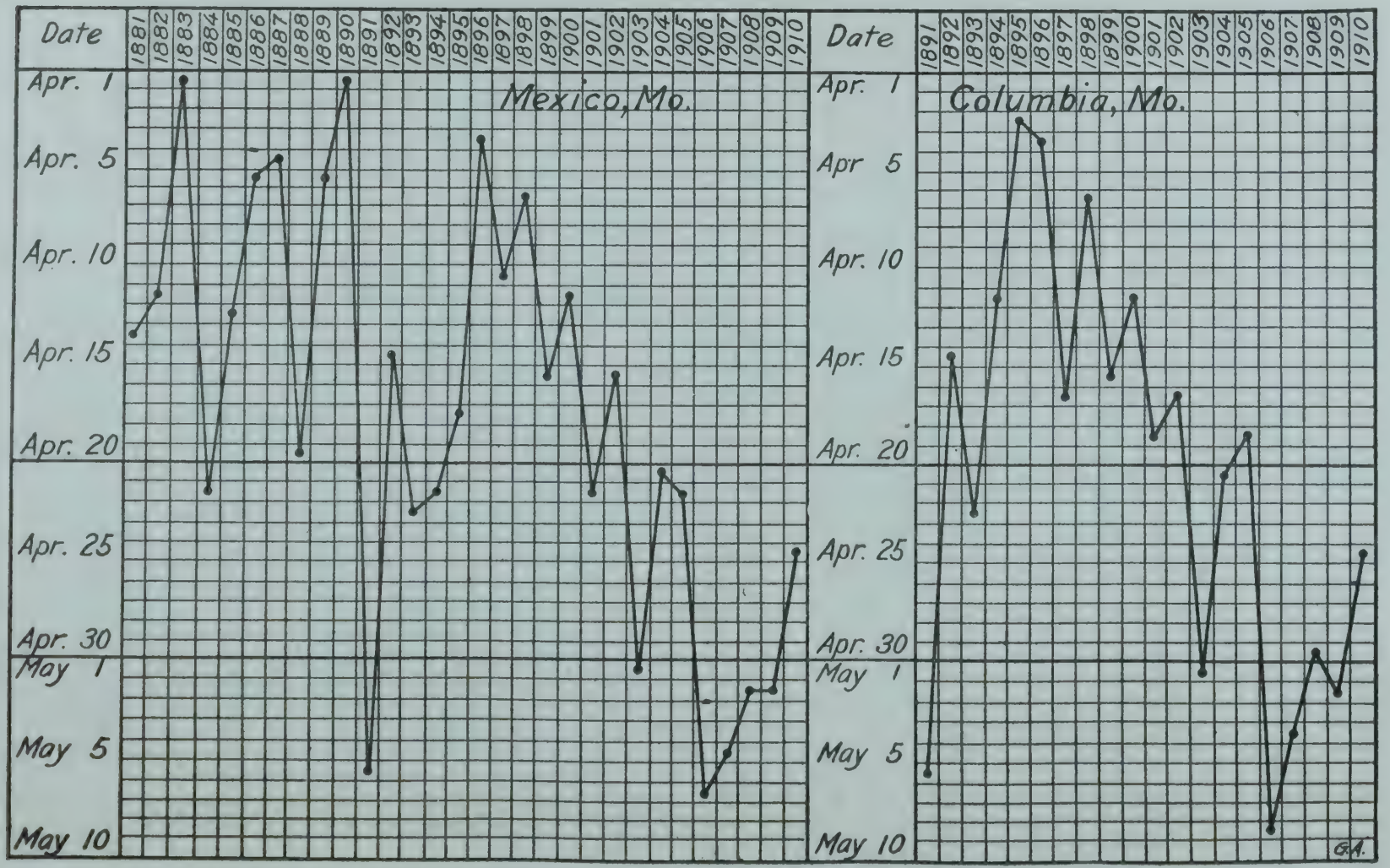


FIG. 8. Table showing fluctuations year by year, in the date on which last freezing temperature for the season occurred at both Mexico, Missouri, and Columbia, Missouri. The extremes seem to run in ten year periods.

ing ten years there were three, one occurring in May; and during the last 10 years, bringing us down to the spring of 1910, there were 9, 5 of which occurred in May. We may disregard the record of the period from 1881 to 1890, as the data are based upon eye observations and dry thermometer records, but the data for the 20 years beginning with 1891, at Mexico, agree with similar data recorded at Columbia during the same period. Beginning with 1896, the record shows a peculiar oscillation of the frost isochronals; the advances and retreats are interesting from the view that each advance was greater than the retreat until the line of April 30 was crossed; the two following years the forces were very nearly equal, but in 1906 King Frost was again successful, crossing into May, where he maintained his forces, though apparently strictly on the defensive, for four successive years, a phenomenon unparalleled by previous records in this State covering three decades. It will be noticed that after 1906 the retreats are greater than the advances, the last retreat, as shown in the spring of 1910, it is to be hoped—especially from the horticulturist's point of view—may turn into a complete rout.

TABLE III.

DATE OF THE LAST KILLING FROST, OR A TEMPERATURE OF 32 F. OR LOWER IN SPRING, AT MEXICO, MO., 1881-1910.

FIRST DECADE.

Year.	Month and date.	Day of year.	Year.	Month and date.	Day of year.
1881	Apr. 14	104	1887	Apr. 5	95
1882	Apr. 12	102	1888	Apr. 20	111
1883	Apr. 1	91	1889	Apr. 6	96
1884	Apr. 22	113	1890	Apr. 1	91
1885	Apr. 13	103			
1886	Apr. 6	96	Average	Apr. 10	100.2

SECOND DECADE.

1891	May 6	126	1897	Apr. 11	101
1892	Apr. 15	106	1898	Apr. 7	97
1893	Apr. 23	113	1899	Apr. 19	106
1894	Apr. 23	113	1900	Apr. 12	102
1895	Apr. 19	109			
1896	Apr. 4	95	Average	Apr. 16-17.	106.8

THIRD DECADE.

1901	Apr. 22	112	1907	May 5	25
1902	Apr. 16	106	1908	May 2	123
1903	May 1	121	1909	May 2	122
1904	Apr. 21	112	1910	Apr. 21	115
1905	Apr. 22	112			
1906	May 7	127	Average	Apr. 27-28.	117.5

Average date of the last 10 years, 11 days later than preceding 10 years.

TABLE IV.

DATE OF THE LAST KILLING FROST, OR A TEMPERATURE OF 32 F. OR LOWER, IN SPRING, AT COLUMBIA, MO., 1891-1910.

FIRST DECADE.

Year.	Month and date.	Day of year.	Year.	Month and date.	Day of year.
1891	May 6	126	1897	Apr. 17	107
1892	Apr. 15	106	1898	Apr. 7	97
1893	Apr. 23	113	1899	Apr. 16	106
1894	Apr. 12	102	1900	Apr. 12	102
1895	Apr. 3	93			
1896	Apr. 4	94	Average	Apr. 15-16.	106.8

SECOND DECADE.

1901	Apr. 19	109	1907	May 4	124
1902	Apr. 17	107	1908	Apr. 30	120
1903	May 1	121	1909	May 2	122
1904	Apr. 21	112	1910	Apr. 25	115
1905	Apr. 18	108			
1906	May 9	129	Average	Apr. 26-27.	117.5

Average date of the last 10 years, 11 days later than preceding 10 years.

CHANGES IN THE EARTH'S CLIMATE.

While there is abundant evidence in the records of geology to prove that great changes took place in the earth's climate during prehistoric ages, the world's leading meteorological authorities generally concur in the opinion that there have been no appreciable climatic changes during the period covered by authentic history. The popular idea that the climate is changing is evidently an old one, and is caused by the temperature and precipitation conditions remaining for comparatively short periods below or above the normal conditions; such changes should be referred to as oscillations in the weather rather than as changes in the climate.

CONCLUSION.

It appears from climatological data of the Columbia station, and a few others given here, that the springs of the last ten years experienced quite marked temperature departures from the normal. The most interesting, as well as the most important question to be answered is how long will the cold period last? Unfortunately, our climatological data do not cover a sufficient length of time to enable us to work out the number of

years to each cycle. While the records show periods of both mild and cold springs for the 30 years, the change during the last 20 years from mild springs to unusually cold springs is not only of marked interest to the climatologist, but bears rather more serious import to the orchardists, whose earnings have been affected, and who are, of course, interested in the question of whether mild springs will ever come again.

As we are unable to answer this question positively, and as it is rather more pleasant to be optimistic than pessimistic, we will look to the future springs from the brighter side. It is quite evident that freezing temperatures in May are abnormal for Missouri, especially most of that part south of latitude 39 degrees 41 minutes N. The frost isochronals of the last four years, while unusually late, rather indicate a return to more normal conditions. While it is possible, of course, the next ten years may furnish several Mays in which freezing temperatures will occur, the probabilities are that the tendency will be more and more toward the conditions that prevailed from 1894 to 1902, inclusive, which from the record appear to have been highly favorable to the fruit man. Possibly by the close of the decade ending with 1930, the average date of the last killing frost in spring will have receded to where it was, as claimed by the "old timers," in the eighties—along about April 12.

Doubtless at that period the youth of today, then a man of middle age, will be declaiming to all who will listen that "our climate has changed; the springs were colder when I was a boy." "Why," he will continue, "the springs were so cold we had to use mechanical heaters in the orchards during those days to get any fruit at all." And to prove what he says he will point to the old heaters rusting away in the barn.

And thus the pendulum may swing the other way, and again later on swing back to where we are today, continuing to swing back and forth for stated periods for centuries to come. Such are the so-called cycles or oscillations of the weather.

While the hoped-for period of mild springs may return during the next ten years, nevertheless, we should be prepared to combat, whenever necessary, the late spring frost with scientific methods. Every fruit grower on a large scale should equip himself with the necessary heaters and a few good thermometers. It has been demonstrated in Colorado and Kansas that 70 to 80 heating pots to the acre (and I would not recommend less) are sufficient to save a fruit crop when the temperature outside the protected area falls to 25 degrees and even as low as 22 degrees. Perhaps some of you have followed such methods in Missouri.

The pots should hold about 8 quarts of fuel oil, and, in the majority of cases, it will not be necessary to light them until about 2 a. m., or later.

The oil is not costly, and it seems to me that the little extra cost and labor are small items when compared with the damage one frosty night will do to an orchard when no effort is made to save it, and what the loss or saving of that crop means to the owner.

Where there are telegraph facilities, and if the funds on hand permit, timely warnings will be sent by the Weather Bureau. There are many places that cannot be reached by telegraph, but nearly all towns, and, in fact, many homes have the telephone installed. The Bell, Kinloch and the Missouri and Kansas Telephone systems co-operate with the Weather Bureau in the dissemination of the weather forecasts and warnings, and in many cases the fruit grower can obtain the information free of cost by simply calling up the nearest exchange.

Personally I should be glad to render any assistance needed in the way of advising how to place and read the thermometers and when to start the heaters. Those having orchards in the valleys, or so-called pockets, should be particularly watchful, especially if the night is clear with little or no wind, as, owing to air drainage, the valleys become colder than the hillsides when there are no clouds; on the other hand, when the sky is heavily overcast or when there is moisture in the form of either rain or snow, there is little difference between the temperature of the valleys and the hills, or if there is any difference, the valleys are warmer. There appears to be less damage to fruit by frost on or along the Southern Ozark border, which has an elevation between 500 and 1,000 feet, than in either the valleys or on top of the highest hills; this is probably due to the fact that the air of comparatively still, cold nights, when usually the greatest damage is done, is kept moving and probably mixing at the elevations lying between the two extremes, by reason of drainage currents.

DISCUSSION.

Dr. Howard.—It would seem from the paper that has been read that the seasons swing like a pendulum, back and forth, getting a little farther off from the normal each year. That continues for a period of possibly thirty years. Now, the records, as I understand it, show that there is some hope that we may have reached the end of this last cycle, and we are now starting on a period where King Frost is on the retreat.

Mr. Reeder.—I believe we have reached the end of a cycle. Next spring may have late frosts, but the evidence clearly shows that frosts are now on the retreat.

Dr. Howard.—I was so much cheered at the outlook when I read that paper before Mr. Reeder read it here, that I would like to ask whether or not he has had any opportunity to study the records of the eastern states

where they have data for a long time back, to see what the conditions there are?

Mr. Reeder.—The weather bureaus of those states are in the larger cities. I could use the records covering thirty years, but the records do not mean anything outside the cities. Take St. Louis, for instance; they never have a killing frost inside the city. The records of the Weather Bureau there show nothing but the conditions in the city.

Mr. Darche.—It was said this morning that during the blooming period is the most tender time for our fruits. How long does that time last?

Dr. Howard.—What do you mean by the flowering period? If you mean when in full bloom, peaches will then stand a temperature of 26 degrees, but they are not in their most tender stage. They get more tender as the fruit grows older. The older the fruit is the more tender it is. They will stand only two degrees of freezing after the blooms have dropped off. Thirty-two degrees is the danger point when the "shuck" is falling off. When the fruit gets the size of your thumb one degree of freezing would perhaps cause the fruit to turn black.

Prof. Dutcher.—In fighting against freezes with heaters, will it do to stop when the blooms drop?

Dr. Howard.—No; we must know the amount of cold the fruit will stand in its various stages of development. For example, when the buds are beginning to swell, when they are showing pink, when they are almost open, when they first open, and when their petals drop off.

Mr. Hitt.—Will that hold good right out in the orchard? When the peach is in bloom there is foliage on the tree. Is that foliage a protection to the peach? They always stand 27 degree when they are as big as my little finger.

Dr. Howard.—The foliage, when the leaves are of good size, undoubtedly would supply considerable protection by preventing a movement of the air among the branches. The temperature danger points I have mentioned were secured by artificially breezing thousands of buds and flowers at various points and then finding out by slicing them open and examining them which ones were killed and how much cold it took to do the work.

Mr. Hitt.—Is the most dangerous time when the fruit is in bloom?

Dr. Howard.—The flowers are very tender then, but at that time they can stand five or six degrees of freezing, while after the fruit has set they could not stand more than one degree.

Mr. Griffin.—I, for one, follow the plan of securing information from St. Louis, direct. Last year I called those people about two o'clock one

afternoon. I wanted to know whether there would be a freeze. I did not want to make a mistake in lighting my heaters too soon. They told me there would be a severe freeze that night and I hurried around and lighted my heaters. There was no freeze that night, nor for several nights. Why is it that they cannot tell?

Mr. Reeder.—The atmosphere is a gas. It is changing all the time. An area of high pressure moves in such a manner that freezes will occur. A man at a certain station may predict frost in his locality and there will be one but a few miles distant there will be no damaging frost. It is impossible in a message of that kind to say where these freezes will occur. You should have thermometers yourself and use them. Frost is a very peculiar thing. Conditions change very rapidly, especially in the spring.

SOME PHYSIOLOGICAL FACTORS IN STRAWBERRY GROWING.

(By H. C. Pope, Sarcoxie, Mo.)

It is true that in a practical way our knowledge of strawberry growing is sufficient to produce profitable crops to a certain degree, but are the profits large enough from the average crop to enable the growers to build up homes and make advancements like the farmers of Northern Missouri or of Iowa, Kansas and similar states? They are not. Then wherein lies the trouble?

One reason is that too little is known about the strawberry physiologically. This is not only true of the growers, but may be applied in general. Nearly our entire literature on strawberry growing is on variety tests and general cultural methods, such as have been used for several years. What we want today is a thorough knowledge of the physiological requirements of the plant. We know that occasionally a field of strawberries will yield as much as five hundred crates per acre, but just what is it that produced the increased yield? Not until we have learned more about the plant will we be able to tell, and just so long will we have to wait until we can produce five hundred or more crates per acre and do it repeatedly.

In a discussion of some of the various phases of strawberry growing some of them will have to be considered only in a very general way, because of our lack of definite knowledge concerning them.

The Soil.—It is a known fact that new ground of a certain nature will produce better berries, as a rule, than any other kind of soil. The question is, what is there about this soil which gives the plants this marked influence? We can readily theorize on it, but theories are not

facts. The question is, how can we build up old ground so that it will yield the maximum amount of berries? As long as there was plenty of new ground the question of the soil and soil fertility received very little thought, but today new ground is largely a thing of the past, and when strawberries are planted on old ground, we find that the yields are very much decreased. What is the reason? The answer will only come when we have made a scientific study of the plant with regard to its soil requirements, both chemically and physically.

Runners and Fruit Buds.—When the plants are set in the spring the sooner we can get them started to growing and forming runners the more desirable it is. Generally speaking, with that class of plants which form crowns, the more food they store up the more luxuriant will be the growth next spring. With the strawberry it has thus been concluded that the more mature the plant is, and the greater the amount of stored food that it may have in its crown, the earlier and more abundant will be the runner growth, provided the fruiting buds were all pinched off and not allowed to produce fruit. Nearly all of the literature on strawberry culture recommend that the fruiting buds be pinched off, so that the stored food may not be wasted in the production of fruit, but that it may be turned to the production of runners. The formation of fruit and runners has no such relation to one another. The fruiting buds come from the crown made during the last season's growth while the runners come, not from this old crown, but from a new crown which forms above the old one.

In going over a newly set bed in the spring, we occasionally find plants which have started to form runners while the greater part of them have made no runner growth, and also very little leaf growth. This is due to the fact that they formed no fruit buds, and consequently there is no fruiting energy to be gotten rid of, and for some reason, which lacks explanation, a runner growth is started early in the season.

Fall Plants.—Plants which are formed very late in the fall very often set no fruit buds, and as a result, start a runner growth very early in the spring. This has been observed by some growers, and by some it is advocated that these plants be used for setting. The objections to these plants are that they are lacking in vigor, due to immaturity and development of root system; also, that the soil conditions must be more ideal in order to make them live. Apparently, then, in growing plants for setting, the object would be to produce good strong plants in the plant bed under such conditions that they would form no fruiting buds, but instead have their energy turned to the production of early runners. An objection may be raised to this that such methods would have a tendency toward barrenness. While it may be possible for bud variation to occur within

the strawberry plant, yet it is doubtful if it has ever been seen. But variation is a thing which the grower needs to give but little or no consideration. The fact that one plant bears more fruit than another grown by its side is not due to bud variation, but due to the advantage that it had in developing.

The plant which is formed first in the spring has the advantage in time and food supply, but later when the plants become crowded the amount of available plant food in the soil is not so abundant as it was, and the foilage growth becomes restricted because of the lack of room in which to develop. Thus the amount of food manufactured in the leaves is reduced, and as the growing period is also shortened it will readily be seen that plants grown under such conditions cannot be as mature as the ones which start early in the season.

Pedigree.—For the sake of those who may have been wrongly influenced by the terms "Pedigree," "Thoroughbreds," etc., the matter will be given some consideration. When we speak of pedigree or registered live stock, we think of them as being individuals of a known ancestry of both male and female side for a number of generations back. How is it with the strawberry, and how are the varieties originated? Some one interested in obtaining new varieties crosses two varieties and plants the seed. He knows nothing about what his progeny will be, nor does he know anything about the inherent characters of the germ plasm of either of the male or female plants. He grows the seedlings and out of a very large number he finds one of exceptionally good quality. This plant is now propagated by means of runners, and after a time these are grown by various growers as being identically the same plants. However, the idea soon occurred to certain growers that if their plants were advertised as "pedigreed," "thoroughbreds," "carefully selected," etc., that it would appeal to the public. The scheme worked, and is working admirably still, and people are paying more for their plants because they think they are getting a far superior plant. The fact is that they can get the same plant with the same breeding and with the same prolificness for less money from their home neighbor or plant grower.

Moisture.—In order to set plants in the best possible way and to obtain the best possible results, it is highly important that the grower should know something about the way in which the plants obtain their moisture. One of our greatest troubles is that we too often work in the "dark." That is, we do things, but know not why we do them. As long as we are forced to work under such conditions our advancement will naturally be slow. Plants, as we all know, take their moisture through their roots, but in order to get a clearer understanding, let us divide the roots into two classes, the main roots and the root hairs. The former are those which

we ordinarily call roots, comprising, as they do, the smallest fibrous roots as well as the larger ones. The latter, which are known as root hairs, are very fine and delicate structures, which radiate out in all directions from the growing ends of the roots. In digging the plants, these structures are always rubbed off and will probably never be observed unless the plant is grown under special conditions. It is through these root hairs that the plant gets its large amount of water. However, we know that the plant will remain alive after being reset, for some time (provided it has been properly set and there is plenty of moisture in the soil) before new root growth with root hairs takes place. Thus it is seen that slight amount of water must have been taken in through the old roots.

Stage or size of Plants.—The question is, what is the best stage for the plant to be in when being transplanted? It has long been recognized by growers that the dormant plants are the best to set, the reason for this being that there are no leaves to draw the water out of the plant before the roots have a chance to become established. In setting a plant in the dormant stage, the roots are placed on an equal balance with the leaves, and growth starts in very much the same way as it would have done if it were left in the plant bed. If dormant plants could be had in perfect condition and at the same expense as plants in the growing stage, then there would be no question but that the dormant plant would be the one to set. However, to obtain a dormant plant and have it remain in perfect condition until ready for planting is something which is practically impossible.

Best Method of Planting.—The best method is to reset the plants as soon after digging as possible. However, the plants at this time will have made considerable leaf growth and require a large amount of water, which supply is entirely cut off so long as the plants are out of the ground (or unless packed in wet moss or the like). This important factor necessitates the right kind of care of the plants after being dug in order to obtain the best results. It is highly important that the roots be kept moist and not allowed to become dried out at any time. If the roots have not been allowed to become dry, they will start to growing very soon after being reset if the ground is moist. The first growth usually takes place on the small fibrous roots, and later larger roots will push from the crown. Thus, if the small fibrous roots have been destroyed by drying, the plant will have to wait that much longer before it can get an adequate amount of water to start growth.

Another factor which is probably of as much importance as keeping the roots moist is the pruning of the leaves. As soon as the plants are dug they should be placed in a wet sack and taken to a shady place to be cleaned. In the cleaning, all leaves should be pulled off that have opened.

FIG. 9. Medium sized plants; (*a*) before pruning; (*b*) as ordinarily pruned—too much leaf surface; (*c*) properly pruned.

FIG. 10. A large plant before and after pruning. The roots were shortened on account of their great length.

This stops evaporation of moisture from the plant, and keeps it from drying out after being reset. See Figs. 9 and 10.

Soil Preparation.—In preparing the soil for the plants, the main object should be that of bringing plenty of moisture to the surface. This can only be done by a thorough firming process. After plowing, the soil should be well harrowed to pulverize all lumps, after which a good drag should be used to make the surface as smooth and level as possible. After dragging the field, it should be rolled with a heavy roller, which settles or firms the soil. The closer the particles of soil are brought together, the greater will be the amount of water that will rise to the surface.

Setting the Plants.—The thing to be remembered in setting plants is that all roots should come in close contact with moist soil. This is accomplished by firming the soil well against the roots. The most common method of setting plants is by the use of the dibble, which works fairly well if used by good hands. The main objections to it are that it makes a small hole, into which the roots are easily wadded by careless workmen. It also requires effort to set the plants firmly, something which very few men care about doing when working for some one else. If your plants are not set tightly you can figure on the larger part of them drying out, unless they are made firm by a heavy rain shortly afterward.

The spade is a very good tool to use for setting. It has the advantage over the dibble in that it makes a wider and deeper hole, thus giving more room in which to spread the roots; it also dispenses with the pruning of the roots. The setting or firming of the soil against the roots is done with the foot, and when well done the plant is set much better than when set with the dibble. However, if the help is indifferent and worthless, the work may be done as poorly with the spade as with the dibbler when used by the same class of help. The thing to be remembered is to set the plants tightly in the soil, so that they will get plenty of capillary moisture.

Cultivation.—The plants should be set so that they can be cultivated both ways. There is no need of cultivating the plants before a rain; to do so is only a waste of time and an injury to the plants if the soil be cultivated around the plants.

When the plants are newly set it is not a question of how much moisture that can be maintained in the soil, but how much of it you can get to the plant. There would be no objection to working the middles, if need be, but the soil should be left firmed around the crowns to draw moisture until a good rain is had.

Strawberries require much hoeing, but at no time should they be hoed deeply. All that should ever be necessary is to break the crust which forms after a rain. If possible, they should be gone over in the early part of the season after each heavy rain. When runners start, the plants

should not be hoed any more with a common blade hoe, for at this time new roots begin to push from the new crown in a lateral direction, and will be cut off if the blade hoe is used. The hoe to use from this stage on is a prong hoe, with a blade on the back for cutting weeds. Another important factor is that of level cultivation. Keep down the ridges as much as possible. The reason for this is that the ridge will dry out faster than level ground.

DISCUSSION.

Dr. Howard.—In your opinion, does it make any difference whether we select plants for setting out from fruiting plants or those which have been prevented from fruiting?

Mr. Pope.—Grow plants in special beds. Set them in a good, rich soil, and then use the the one-year old plants for setting out. A plant which has a two-year old crown should never be set.

Dr. Howard.—Do you prevent those plants in the propagation beds from fruiting?

Mr. Pope.—Two years ago we wanted to set out some plants. We didn't want to buy any, so we dug up plants from our old bed we had the year before and set them out. We got some from a neighbor and set them in another bed. Our own plants formed fruiting buds, while in the other bed there were a very few which formed fruiting buds. Those which did not form fruiting buds had early runners.

Question.—Do you prefer late or early plants for setting out?

Mr. Pope.—Plants which form fruiting buds are generally weak. Such plants, if not set in ideal conditions, will die. More mature plants are hardier and will stand a little worse treatment.

Mr. Darche.—I would like to ask if the beds are in good condition now?

Mr. Pope.—In excellent condition.

THE INFLUENCE OF ENVIRONMENTAL CONDITIONS UPON THE DEVELOPMENT OF PLANT DISEASES.

(By George M. Reed, Assistant Professor of Botany, University of Missouri.)

The fact that serious epidemics of many plant diseases are associated with definite weather conditions has been repeatedly noted. The agriculturist has often observed that the blighting of potatoes, the rotting of grapes, or the rusting of wheat has had a close relation to the amount of moisture during a given period. It is not surprising, therefore, that the amount of rainfall, abnormal variations in temperature,

etc., have been considered the direct cause of serious losses to cultivated crops by those who have had no intimate knowledge of the real nature of the common maladies of plants.

While many, doubtless, still believe that weather conditions are the cause of damage to growing crops, most people have come to recognize the weather, not as the direct cause, but rather as a set of conditions which may favor or hinder the development of a living organism which is the real agent in causing the injury. It has been well established that those losses which occur in epidemic form are due to the growth and development of a living organism. For the most part plant diseases result from the growth of a fungus or a bacterium which lives as a parasite in the tissues of the higher plant. Such diseases are infectious, for the parasite spreads rapidly from one host to another under favorable conditions. The weather is important, therefore, as a set of complex conditions which influence the progress of the causal organism.

Plants, of course, may suffer directly on account of unfavorable environmental conditions, as lack of moisture, low temperature, etc. These injuries, however, are quite different from the frequent severe outbreaks of disease due to living organisms.

Fungi and bacteria are the principal causal organisms of disease in plants. Like all other vegetation these organisms are influenced by the various factors which make up their environment. Light, water supply, temperature, etc., play a very important part in their development.

Such environmental conditions as temperature, water supply, light, etc., may influence plant diseases in two distinct ways. They may act directly on the host plant and make it less able to resist invasion by the fungus. On the other hand, the effect may be upon the parasite; additional moisture, for example, may aid in the germination of the spores. The same set of conditions, of course, may act in both ways at the same time. A particular condition may be unfavorable for the best development of the host and, at the same time, increase greatly the changes of the fungus for invasion. The inter-relationship of host and parasite is very complex and environmental conditions may exert a very great influence in the progress of disease.

Many fungi, such as the rusts, powdery mildews, etc., are able to invade the normal healthy tissues of their host. They are strict parasites and are able to attain their full development only on living plants. Other fungi, as the brown rot of stone fruits, are able to live readily on dead organic matter; under suitable conditions, however, they may invade the tissues of living plants and develop at the expense of their cells. They are thus hemi-parasites, or facultative parasites.

The strict parasites will be aided to a very great extent by the direct effect of environment. Any condition which assists in the dissemination of the spores, their germination and subsequent penetration of the host tissues, will have a marked influence in the development and progress of disease. While the hemi-parasites will also be aided in this direct way, any condition that tends to injure or weaken the host or break down its resistance will increase the chances for fungous invasion.

Some experimental work has been done towards determining the influence of various factors of the environment in the spread of certain diseases. For the most part, however, the facts known are the result of casual observations, made in connection with other experimental work. It is further true that little has been done towards isolating the different factors and determining the effect of each. A particular epidemic may be due to increased water supply, or to peculiar temperature conditions, or to these combined. Sometimes we may be able to pick out the more important relation, but more often it may prove to be a combination of factors which brings about the conditions favorable for an epidemic of some serious disease.

INFLUENCE OF SOIL CONDITIONS.

Root Rot of Tobacco.—The reaction of the soil has been shown to be a factor of considerable importance in certain fungous diseases of plants. Many fungi are markedly influenced by the acidity or alkalinity of the substratum. Briggs[1], in Connecticut, has found that the root rot of tobacco is much more serious in an alkaline soil. For the best results in growing tobacco the soil must be enriched by the addition of fertilizers. Where lime and alkaline fertilizers are used there is a marked occurrence of the disease. The fungus (*Thielavia basicola* (B. and Br.) Zopf.) attacks the tobacco roots very severely in soils which are made alkaline by the use of large quantities of lime, ashes or fertilizers containing large quantities of carbonate of potash. Briggs has found that the use of acid fertilizers has been effective in controlling the disease. In this way the soil is sufficiently enriched for the tobacco plants and at the same time favorable conditions for the fungus are avoided.

Club-root of Cabbage.—It has long been known that the club-root of cabbage and related plants is influenced by soil conditions. The disease is caused by a slime mold, *Plasmodiophora brassicae* Wor. The organism enters the young roots of the host. After penetration it develops within the root tissues and gives rise to the characteristic malformations.

---

[1]Briggs, Lyman J.—The field treatment of tobacco root-rot. Bur. Pl. Ind. Circ. 7:1-8. 1908.

It was early observed that on Long Island, where cabbage fields were enriched with the shells of mussels, etc., the disease was not destructive. This observation led to experiments by Halsted[2] and others to determine the value of adding lime to the soil. It was found that liming the soil was very effective in controlling the disease. The disease has always proved more severe in acid soils and losses from the trouble may be prevented by making the soil alkaline by the use of sufficient quantities of lime.

Root Rot of Beets.—A similar relation seems to exist for a serious disease of sugar beets, due to *Corticium vagum* B. and C. var. *solani* Burt[3]. The fungus usually enters the host at the bases of the leaves. The diseased tissues soon blacken and then the leaves wilt. The disease later spreads back into the crown and causes the characteristic rot.

It has been observed that the disease is not usually serious where wood ashes have been applied to the soil. The fungus has also been tested in the laboratory on acid and alkaline media and it has been found that it thrives much better on decidedly acid nutritive substances. These facts have led to liming the soil, where the disease prevails, with evident success.

Texas Root Rot of Cotton.—That aeration of the soil is of importance is shown in connection with a disease of cotton caused by the fungus *Ozonium omnivorum* Shear[4]. The fungus lives in the soil and under favorable conditions attacks the roots of cotton plants. It destroys the rootlets and then spreads into the vascular tissues, causing the plants to wilt. Experiments show that lack of proper aeration of the soil is one of the most important factors favoring the disease. The organism grows best where the aeration of the soil is poorest. A remedy has been found in the improvement of the soil aeration by deeper plowing and also by fall plowing.

THE INFLUENCE OF WATER SUPPLY.

It has long been recognized that the amount of rainfall has had a marked influence on the spread of fungous diseases. Quite generally associated with rainfall are marked changes in temperature. While it is often practically impossible to distinguish between these two factors, yet in certain cases, at least, the water factor is the more important.

---

[2]Halsted, B. D.—Club-root of cabbage and its allies. N. J. Agric. Exp. Stat. Bull. 98. 1893.

——— Experiments with club-root of turnips. N. J. Agric. Exp. Stat. Rep. 20:354-366. 1899.

[3]Duggar, B. M.—Three important fungous diseases of the sugar beet. Cornell Agr. Exp. Stat. Bull. 163. 1899.

[4]Shear, C. L.—Texas root-rot of cotton; field experiments in 1907. Bur. Pl. Ind. Circ. 9:1-7. 1908.

Water supply may have a direct effect on the parasite, aiding in the germination of the spores. On the other hand, the main effect may be produced on the host, resulting in a more rapid growth, an increase in the size of the cells and the development of more succulent tissues. In either case a disease may become much more severe in its effects.

Asparagus Rust.—The most serious disease of the asparagus is the rust caused by *Puccinia asparagi* DC. As a result of a number of observations and experiments the relation of water supply to epidemics of this disease has been traced out. In Massachusetts, Stone and Smith[5] found that there was a great variation in the prevalence of rust, depending upon whether the beds were located in soil that retained large quantities of water. They found that the asparagus suffered much more severely upon the drier soils. In some localities, where the chances for infection were equal, the beds upon the heavier more moist soils, showed practically no rust, and then not until late in the season, while the beds located upon light, dry soils, became badly infected very early in the summer. The seasons of 1895-1896 were unusually dry, and the rust was found prevalent on nearly all the beds. On the other hand, the season of 1897 was one of excessive rainfall and during this year many beds, which ordinarily rusted badly, showed very little rust, and then only quite near the close of the growing season.

The facts are explained on the view that the vitality of the asparagus plants was much reduced in dry seasons and on the drier soils, and in consequence the fungus was able to invade the host more successfully. When sufficient water is present the host is able to grow more vigorously and thus be better able to withstand the invasions of the parasite.

Sirrine[6], in New York, contributed some new observations on this disease. He found that excessive dew fall was specially favorable to the progress of the rust. The amount of dew was, furthermore, more important than rain.

In California, where irrigation is resorted to, Smith[7] was able to test the question experimentally. He found that if asparagus beds were left without irrigation and cultivation in the summer they became extremely dry. In such beds the rust spread rapidly and the plants suffered severely, the tops dying down to the ground. On the irrigated and cultivated beds the plants were green and vigorous and also free from rust. The driest beds rust first and most severely.

---

[5]Stone, G. E., and Smith, R. E.—The asparagus rust in Massachusetts. Mass. Agr. Exp. Stat. Bull. 61. 1899.

[6]Sirrine, F. A.—Spraying for asparagus rust. New York Agr. Exp. Sta. Bull. 188. 1900.

[7]Smith, R. E.—The water relation of *Puccinia asparagi*. Bot. Gaz. 38:19-43. 1904.

Smith concluded that there was both a direct and indirect relation of water to the spread of asparagus rust. The indirect relation is the effect of moisture acting on the parasite through its effect upon the host and is limited to the soil water. With plenty of water, the host developes vigorously and is able to resist invasions by the rust. This is shown by varying amounts of rainfall in different seasons, by differences in the water containing capacity of different soils, and by the effects of irrigation. Except under unusual weather conditions, this indirect relation is the most important.

The direct relation is the effect of moisture acting upon the spores and mycelium of the fungus. Dew is necessary for spore germination and subsequent infection by the parasite and is of more importance than rain. Atmospheric dryness checks also the formation of aecidiospores and uredospores, while moisture aids spore formation.

Carnation Rust.—The carnation rust (*Uromyces caryophyllinus* (Schrank) Winter) was introduced into this country from Europe, being first reported about 1890, and immediately became a serious menace to the growing of carnations. Some growers seemed especially to suffer from the disease, while the plants of others were relatively free. Although differences in susceptibility of varieties were observed, yet it was found that two growers might use cuttings from the same plants and one have abundant rust and at the same time, the plants of the other grower might remain relatively free from the disease.

Although all the conditions which favor or retard the spread of the disease are not fully known, it has been found that the method of watering is of prime importance. The rust spores require water for germination; consequently, if the leaves of the carnation in the process of watering the plants become wet, the fungous spores find favorable conditions for germination and subsequent penetration. On the other hand, subirrigation has proven an efficient method for keeping down the rust. It is important, furthermore, that the leaves should not come into contact with the wet soil and a good free circulation of air among the plants should be provided.

Grain Rusts.—The rusts of our common cereals have proved disastrous in practically all parts of the world. Observers everywhere have noted the fact that the damage is much greater some years than others. "Rust years" are spoken of and epidemics of the disease are associated with certain fairly definite weather conditions.

A large number of observers have estimated the damage done to cereal crops by various rusts, the most serious of which seems to be the

---

[8]Stewart, F. C.—Combating carnation rust. N. Y. Agr. Exp. Sta. Bull. 100. 1895.

black stem rust—*Puccinia graminis* Pers. One of the most interesting was made by Sorauer[9] for the German empire.

Crop.	Rust.	Estimated Financial Loss.	Year.
Wheat	*Puccinia graminis*	$18,000,000	1891
"	" "	1,600,000	1892
Rye	" "	45,000,000	1891
"	" "	1,900,000	1892
Oats	" "	41,000,000	1891
"	" "	3,000,000	1892

The year 1891 was a characteristic wet year in contrast to 1892, which was dry.

The relation between moist atmospheric conditions and epidemics of rust have been repeatedly observed[10]. Rust infection is specially favored by humid, showery, sultry days, followed by foggy, cool, dewy nights. Great damage will specially occur if these weather conditions appear at the blossom period of the grain.

In those districts where irrigation is resorted to and where there is an absence of dew or rain to wet the foliage, rust never causes serious injuries to the cereals. The formation of dew is most favorable to rust infection. Its presence on the leaves enables the rust spores to germinate and obtain entrance into the interior of the host. Heavy rains may tend to prevent infection by washing the spores from the plants. Moist weather conditions also favor a rank growth of the plants, making them more succulent and susceptible to rust invasion. On account of the moist atmospheric conditions, wheat suffers much more severely from rust in the coast counties of California than in the interior portions of the State[11]. The best wheat regions of the State are located in the interior valleys where the water relations are much less favorable to the rust fungus.

Black Rot of Grape.—This disease of the grape, caused by the fungus *Guiguardia bidwellii* (Ell.) V. and R., has proved to be one of the most serious maladies to the grape grower. It is prevalent in all of the grape districts of the United States. The disease is of American origin and was introduced into France about 1883. Very shortly after its ap-

[9]Sorauer, P.—Welche Werthe hat Preussen im Jahre 1891 durch die Getreide roste Verloren? Zeitschr. f. Pflanzenkr. 3:185-190. 1893.

———, —Das Verhalten des Getreide rostes in trockenen und nassen Jahren. Zeitschr. f. Pflanzenkr. 4:121-124. 1894.

[10]Bolley, H. L., and Pritchard, F. J.—Rust Problems. N. Dakota Agr. Exp. Stat. Bull. 68. 1906.

[11]Shaw, G. W.—Report of progress in cereal investigations. Calif. Agr. Exp. Stat. Bull. 185. 1907.

pearance in Europe it spread throughout the vineyards and threatened very great damage to the vines.

Viala[12] early noted the relation between the serious outbreaks of the disease and moist weather conditions. While the disease is present in the vineyards at all times, it requires a period of wet weather accompanied by a high temperature, to bring about an epidemic. After an outbreak has occurred its progress is quickly checked on the return of a period of dry weather. The disease is also always more serious in humid valleys. This relation between moisture and an epidemic has been observed repeatedly.

Brown Rot of Stone Fruits.—The outbreaks of the fungus (*Sclerotinia fructigena* (Pers.) Schroet.), which causes the brown rot of stone fruits, have long been associated with moist weather conditions. While this fungus is always present in fruit orchards to a greater or less extent, it becomes destructive only during excessively moist weather.

Quaintance[13] has made a special study of the influence of wet weather on brown rot in Georgia. He compared the two years, 1898 and 1900. The former was a good peach year and an unusually large crop of fruit was marketed. In 1900, at the first of June, there was every promise of a fine crop, but fully 40 per cent of the peaches were ruined during the season by the fungus. The following table shows the comparative rainfall for the two years:

Year.	Total Rainfall March-August.	Rainfall June.	Variation from Normal for June.
1898.....	29.23 in.	3.27 in.	—1.43 in.
1900.....	30.36 in.	8.98 in.	+4.58 in.

During June of 1900 rain fell in different parts of the State on twenty to twenty-five days. Practically every day of the month was cloudy and the atmosphere humid. Some of the rains were heavy, while others were light. The air was thus kept humid and the fruit more or less moist. In contrast, June of 1898 was relatively dry and the days clear. It has come to be recognized that in Georgia a wet June means a serious rotting of peaches.

Essentially similar facts have been observed in Missouri. Mr. R. M. Hitt of Koshkonong has furnished me with the following data: The amount of rot in 1910 in unsprayed orchards was almost 100 per cent.

[12]Viala, P.—Les maladies de la vigne (Black Rot:156-203). 1893.

[13]Quaintance, A. L.—The brown rot of peaches, plums, and other fruits. Ga. Agr. Exp. Stat. Bull. 50. 1900.

practically no marketable fruit was obtained in such orchards. The rainfall for June and July was excessively high. At Koshkonong the average rainfall for a period of the last ten years is 4.74 inches for June and 4.87 for July. During 1910 the rainfall for June was 9.01 inches and for July 12.29. A comparison of the amount of loss from the disease shows that the damage is very much less serious in a relatively dry year.

Black Rot of Cabbage.—This important disease of the cabbage is caused by a bacterium—*Pseudomonas campestris* (Pammel) Sm. In some sections, notably Wisconsin[14], it has proved very destructive. The disease makes its first appearance on the edges of the leaves. It begins at the blunt teeth on the margin of the leaf and from there spreads backward through the veins. An examination of the structure of the cabbage leaf shows that the water pores of the plant are located at these teeth. These pores are permanent openings in the plant and through them the excess of water in transpiration escapes. Usually the water passes off in the form of vapor, but if the air is very humid the water collects in tiny droplets at the mouths of these pores. Due to the atmospheric conditions these droplets of exuded water are especially frequent in the morning, and it is quite common at that time to observe a number of droplets clinging to the margin of the leaves.

The bacteria which cause the malady are extremely minute and easily distributed widely over the cabbage field. Some of them will find lodgment in these droplets of water, and, as the organisms are motile, they will make their way into the interior of the leaf. When the atmospheric conditions are favorable the disease spreads very rapidly.

That this is the correct interpretation of the symptoms of the disease manifested in the field is clearly shown by laboratory inoculations. If a few bacteria are placed in these droplets of water the characteristic symptoms of the disease quickly appear. The fact that the disease makes more rapid progress in wet than in dry seasons is thus clearly explained.

Late Blight of Potato.—The late blight[15] of the potato, caused by *Phytophthora infestans* (Mont.) De Bary, is one of the most serious diseases with which the potato grower has to contend. It has proved specially injurious in various parts of Europe and in the potato districts of New England and New York in this country. In the United States the disease appears in epidemic form during the latter part of July, and is most prevalent during August and early September. A few days of

[14]Russell, H. L.—A bacterial rot of the cabbage and allied plants. Wis. Agr. Exp. Stat. Bull. 65. 1898.

[15]Clinton, G. P.—Downy mildew, or blight, *Phytophthora infestans* de B., of potatoes. Rep. Conn. Agr. Exp. Stat. 28:363-384. 1904.

warm rainy weather suffice to give the fungus a start and to bring about the production of conidia on the leaves of the potato plant. These conidia are distributed widely and moist weather conditions favor greatly their germination and the subsequent penetration of healthy leaves. Entire fields of potatoes may be devastated within a few days of moist rainy weather. The vines quickly turn black and die. While warm weather undoubtedly favors the development of the disease, it has been shown that the high temperature of summer will quickly check its spread. The determining condition is a period of rainy, cloudy or foggy weather.

This fungus, in addition to causing the blight of the vines, also causes a rot of the tubers. Rot of tubers also depends, in part at least, upon moisture conditions. In wet seasons the trouble is much more serious on soils which retain moisture. There is, therefore, less rot on well-drained, light sandy soils.

Larch Canker.—This larch disease[16] has proved very destructive to plantations in various parts of Germany. The native home of the larch is in the high Alpine regions of Europe. As the tree thrives unusually well in all parts of Germany, large forest plantations were started more than a century ago in the various lowland regions.

In the Alpine regions the trees suffer only slightly from the canker which is caused by the fungus *Peziza willkommii* Hart. The spores of the parasite invade the tissues of the host through injuries, such as are caused by hail stones, etc. The mycelium developes in the bark of the limbs and trunk and causes the development of the characteristic cankers. Due to the further growth of the mycelium these cankers enlarge from year to year. In the course of time they may extend entirely around the infected limb or trunk with the result that all parts of the tree above the diseased portions die.

While the disease is of common occurrence on the larch in its native Alpine region, it rarely causes serious injury. The trees, however, which are found growing in damp, humid valleys are sometimes severely attacked. All trees exposed to strong air currents remain relatively free. The fruiting stage of the fungus also fails to develop on the cankers in exposed situations. It has been observed that cankers at the base of the trunks of exposed trees, and thus protected by grass and other vegetation, may show the development of the spores. It is clear, therefore, that dry, strong air currents inhibit the progress of the disease.

When the first larch plantations were established in the lowlands, the canker was left behind. With the extension of pure larch forests, how-

[16]Hartig, R.—Text-book of the diseases of trees. Eng. translation. Macmillan & Co. 1894.

ever, the disease was introduced and immediately became destructive. In the dense, humid young forests of pure larch the fungus found extremely favorable conditions for its development. The result was the almost complete destruction of many of the young plantations.

INFLUENCE OF TEMPERATURE.

Temperature is a factor of very great importance in the spread of fungus maladies. This is especially true when definite temperature and moisture conditions combine.

Bitter Rot of Apples.—The fungus which causes this disease, *Glomerella rufomaculans* (Berk.) Spauld. and Von Schr., is a characteristic hot weather fungus[17]. It is a serious menace to apple growing in the southern portions of the apple belt—West Virginia, Southern Illinois, Missouri, etc. It attains its full development during the latter part of July, August and early September—the hot weather period of the season. A few bright hot days, with a temperature approaching 90 degrees F. will be sufficient to start an outbreak. The fruit on the south or sunny side of the tree may be badly affected before the disease is noticeable on the north shady side. The fruit on the inner lower branches, well protected from the sun's rays, often escapes when that on the exposed portions of the same tree is destroyed. There is also a greater percentage of rot on trees partially defoliated by leaf-spot fungi. Even on individual apples the rotten areas develop most rapidly on the part exposed to the sun.

A period of cool weather is sufficient to check an outbreak of the disease, especially if the mean temperature remains below 70 degrees F. Even when conditions are favorable for the disease at the time of picking the apples, the crop can be saved by keeping them at a cool temperature.

Peach Leaf Curl.—Pierce[18] has made a special study of this disease of the peach which is caused by the fungus *Exoascus deformans* (Pers.) Fuckel. In many parts of the United States the malady is often quite serious on account of the defoliation of the trees.

As a result of the observations of a number of people, it is the accepted view that curl is much more prevalent after a cold spell, which occurs as the young buds appear. The disease is rarely serious in a uniformly dry, warm spring. In cases where the infection has occurred, the development of the fungus within the tissues of the host may be checked

---

[17]Scott, W. M.—The control of apple bitter rot. Bureau of Plant Industry. Bull. 93. 1906.

[18]Pierce, N. B.—Peach Leaf Curl: its nature and treatment. Div. of Veg. Path. and Physiol. Bull. 20. 1900.

Selby, A. D.—Variation in the amount of leaf curl of the peach (*Exoascus deformans*) in the light of weather conditions. Proc. Assoc. Prom. Agr. Sci. 20:98-104. 1899.

by the return of warm, dry weather. It has been pointed out that the noted leaf curl years in New York and Ohio (1893 and 1897-1898) were preceded by cold and humid conditions during April, when the buds of the peach normally start their development.

Powdery Mildews.—It is the consensus of opinion among gardeners that the powdery mildew of strawberries is favored by sudden alternations of temperature. The disease seems to be more prevalent if cool nights are followed by hot, sunny days.

Salmon[19] tested the effect of temperature on the germination of the spores of the fungus (*Sphaerotheca humuli* (DC.) Burr. He took strawberry leaves which were covered with the spores and placed them at freezing temperatures for a short time. Then the spores were placed in water at ordinary temperatures and allowed to germinate. It was found that spores subjected to the cold possessed greater powers of germination, a higher percentage of germination and a more vigorous subsequent growth than spores which had been kept under ordinary conditions.

It is also quite generally believed that sudden cooling of roses in greenhouses is an important factor in the development of the rose mildew, a disease which frequently proves very serious to the rose grower.

Rusts.—Eriksson[20] has tested the effect of low temperatures upon the capacity for germination of various rust spores. In his work he placed aecidiospores from the barberry and uredospores from various grasses in ice water and even subjected them to temperatures considerably below the freezing point of water. He found a marked increase in the percentage of germination of the spores treated in this way. In some cases spores placed in water at ordinary temperatures showed practically no germination, while similar spores subjected to cooling for a few hours and then placed at ordinary temperatures, gave a high percentage of germination.

Blight of crucifers.—Melhus[21] has found that chilling has a marked influence on the germination of the conidia of *Albugo candida.* He found that only a slight germination of the spores occurred when they were kept at 22 degrees C. When, however, the spores were chilled for two to five hours at 10 degrees C. a high percentage of germination was obtained. Chilling also favored infection, for radish plants inoculated and then chilled for ten hours showed over 95 per cent of infections. Only a small number of plants inoculated and kept at ordinary room temperatures became infected.

---

[19]Salmon, E. S.—The strawberry mildew. Journ. Roy. Hort. Soc. 25:132-138. 1900.

[20]Eriksson, J.—Ueber die Förderung der Pilzporenkeimung durch Kälte. Centralb. f. Bakt. (Abt. 2) 1:557-565. 1895.

[21]Melhus, I. E.—The relation of temperature to spore germination and infection with *Cystopus.* Phytopathology 1:69. 1911.

LIGHT RELATION AND THE NUTRITION OF THE HOST.

It is by means of the energy of sunlight that the green plants are able to carry on the important process of photosynthesis. Through the agency of the light the plant is able to combine simple substances as carbon dioxide and water into complex organic substances as carbohydrates. The carbohydrates usually formed are starch and sugar. If the light is removed the plant is no longer able to carry on this important work. In addition to its importance in connection with photosynthesis the amount of illumination has a marked influence on vegetation.

Plants grown in partial shade differ greatly in their structure from those which are grown in direct sunlight. Their leaves are usually broader, the cells are proportionately larger and the various tissues contain more water. Plants grown in extreme shade or in the absence of any light manifest etiolation. They are devoid of their normal green color; the stems are longer, more slender, flaccid and weak as compared with plants grown in the light.

The fact that light is of fundamental importance to the healthy development of green plants would indicate that, indirectly at least, it may play a part in the progress of fungous diseases. It is doubtful whether light has any direct effect upon the parasite, but there can be no question but that it is of marked indirect importance in many cases.

There are a few cases on record where a disease may be favored by intense illumination. Celery, for example, is damaged seriously by the early blight fungus, *Cercospora apii,* Fr.,[22] when grown in strong sunlight. The disease seems to develop best during bright, hot days, especially when dews occur at night. The trouble is controlled to a considerable extent by partial shade.

Most fungous diseases, however, develop best under shade conditions. This is notably true of the powdery mildews. These parasites always seem to thrive best on hosts which are growing in situations where the direct sunlight is excluded all, or at least, part of the day. It is a matter of common observation to find the grass mildew on various hosts growing in the shade of trees. The same is true for the powdery mildews on the strawberry and also on cucumbers. As the loss of water is much less in shaded places it is quite probable that the important factor in these cases is the water relation.

Some interesting work has been done on plants which have grown in the darkness until they became etiolated, and then inoculated with the

[22]Galloway, B. T.—Additional notes on celery leaf blight. U. S. Dept. Agr. Rept. (1888) :398-399.

spores of fungi. De Bary[24] found that etiolated plants of Petunia were readily invaded by the hemi-parasitic fungus, *Botrytis*. This fungus cannot attack the normal tissues of the plant. When, however, the abnormal conditions resulting from the absence of light occur, the fungus finds suitable conditions for invasion.

Brooks[25] has shown that the same fungus is able to develop on leaves of lettuce plants which have been kept in the dark until they show signs of yellowing. The normal green leaves, however, are not invaded.

In contrast to these results obligate parasites will not invade such abnormal tissues of their host. Ward[26] found that if brome grasses are grown in the absence of light and thus become etiolated the rust, *Puccinia dispersa* Eriks. and Hem., is no longer able to penetrate and produce infection. It is, however, quite easy to infect healthy green plants of the bromes with the uredospores of the fungus.

I have observed similar results with the obligate parasite, the powdery mildew of wheat (*Erysiphe graminis* DC.) The fungus develops perfectly on green plants. The mildew will not grow on plants kept in a dark box. If a green plant is inoculated and then placed in the dark no complete infection occurs. The fungus starts to grow, but it is unable to complete its development. Further, if etiolated plants are inoculated and placed in the light where they gradually become green, full infection takes place.

Ward[27] has made a special study of the effect of mineral starvation of the host in the case of the Brome grasses and the rust, *Puccinia dispersa,* Eriks. and Henn., which attacks them. He found that the depriving of a grass of one or more of the mineral constituents necessary for its growth had no effect on its susceptibility to the rust. Starved plants were no less and no more susceptible than normal, well-developed plants. To be sure the starved, less developed host plants had less rust on them than the normal, but there was no difference in susceptibility or no change in the virulence of the rust spores taken from the plants grown without some essential mineral constituent.

It is commonly considered that vigor of growth and immunity to disease are equivalent terms. It is thought that a plant that is growing under the most favorable conditions will be less liable to disease. This,

---

[24]DeBary, A.—Ueber einige Sclerotinien und Sclerotinienkrankheiten. Bot. Zeit. 44:377, 393, 409, 433, 449, 465. 1886.

[25]Brooks, F. T.—Observations on the Biology of *Botrytis cinerea.* Ann. Bot. 22:479-487. 1908.

[26]Ward, H. M.—Recent researches on the parasitism of fungi. Ann. Bot. 19:1-54. 1905.

[27]Ward, H. M.—Experiments on the effect of mineral starvation on the parasitism of the uredine fungus, *Puccinia dispersa,* on species of Bromus. Proc. Roy. Soc. 71:138-151. 1902.

however, is only partly true. Sometimes the plant that we consider to be in the best possible growing condition is the one that is invaded, while a plant that is under-developed, more or less unhealthy, is likely to escape invasion by the parasite. This is generally the case with the strict parasites. However, a weakening of the host in any way may increase the chances of invasion by fungi which are hemi-parasitic in nature.

The relation of plant diseases to the various factors of environment offers an interesting field for experimentation. It is well established that serious epidemics are connected with temperature changes, rainfall, etc. In addition to yielding facts of scientific interest a study of these relations will doubtless make possible more successful measures for preventing the damage done anually by parasitic fungi.

DISCUSSION.

Mr. Griffin.—I would like to ask the gentleman who read this paper if there is a difference between Bordeaux mixture and lime sulphur solution in controlling bitter rot?

Dr. Reed.—For bitter rot, it is shown very definitely that Bordeaux mixture, if applied at the proper time, will keep down the disease almost perfectly. Scott's work, in connection with the Bureau of Plant Industry at Washington, shows that lime sulphur is proving better than Bordeaux mixture in many ways, but chiefly because it does not cause the russeting of certain varieties under conditions most favorable for the fungus.

Mr. Wilson.—I find that in my orchard Genitons and Winesaps have knots on them. I would like to know what this is.

Dr. Reed.—From your description, I think the disease is apple scab. This can be controlled by spraying with Bordeaux mixture. Apply the Bordeaux mixture quite early.

Mr. Griffin.—I have had some experience in spraying. I had two power sprayers and used Bordeaux mixture and arsenate of lead. I used three pounds of copper sulphate and three to four pounds of lime to fifty gallons of water. Fruit was perfect where I sprayed, but on the other side of the tree where I quit spraying a few trees, there was no fruit, and the leaves fell off at least thirty days earlier than those trees that I sprayed. I had people to come to my orchard and ask, "How did you do this?" "Why is it that you have so much fruit?" Of course, I used orchard heaters and tried my best to have apples. I did. I sold apples to farmers all around me who had orchards of their own, but had no apples. I notice that where I sprayed with Bordeaux mixture the leaves were burnt. When I sprayed with arsenate of lead I got the same results. It is very plain to me that arsenate of lead has some effect on fungus diseases.

Mr. Wilson.—What is the cause of those knotty apples?

Dr. Reed.—Combined curculio and scab. An insect and a fungus disease. Now, your arsenate of lead stops the curculio. Bordeaux mixture will not do that at all. Arsenate of lead may have some value in controlling the apple scab, but its greatest vaue is in controlling curculio. Bordeaux mixture plus the arsenate of lead will competely control the trouble with your apples.

Mr. Garret.—I am very glad to know what Professor Reed has said in regard to controlling curculio with arsenate of lead. Our people up in Iowa have not been able to do it.

Mr. Lowmiller.—I have a peach orchard. I sprayed with red lime with two pounds of lead. I stopped the curculio.

Mr. Griffin.—What I was going to say is that I am an amateur in spraying. I got all the information I could on the subject of spraying. What I meant a while ago was that arsenate of lead must have some value as a fungus controller because it showed so plainly on the leaves.

Mr. Ward.—I would like to ask Mr. Hitt to tell us something about spraying, as he lives in our county and has sprayed some.

Mr. Hitt.—I have sprayed considerable for the last five years and I met with some experience, as just mentioned, about the Bordeaux mixture burning the apples. I believe every person who has ever used Bordeaux mixture has had the same experience. I used the lime and sulphur till the bitter rot struck us, but was forced to fall back on the Bordeaux after the bitter rot came on. That russeting of the apples is caused from the first spraying while the apples are little. I have talked with a number of the leading apple growers in regard to discarding the Bordeaux mixture and using the lime sulphur. All that I have talked to say they will continue to use Bordeaux. Now, in the eastern states the people say they intend to use lime sulphur and discard Bordeaux. Our apples did not scab this year. In this connection, I want to give the rainfall for this year and the average rainfall for the last ten years. The results are: Average rainfall for the month of July for ten years is 4.8 inches. This year 12.29 inches. Average rainfall for the month of June for ten years is 4.74 inches. This year 9.01 inches. This year there were no good peaches in the orchards except those that were sprayed. I never saw brown rot so bad and destroy a fruit crop as rapidly as it did this year. Mr. Griffin spoke of the arsenate of lead being a good spray for fungus diseases. This question has been much discussed in recent years. Whether it is a fungus or an insect which causes the brown rot, arsenate of lead alone has shown very favorable results. Invariably rotten peaches are wormy.

Mr. Heaton.—Which spraying is it, the first, second or third, that gets the curculio?

Dr. Reed.—The first one after the blossoms fall does the work for the curculio. Up until a year or two ago, we were trying to control brown rot by getting after the brown rot fungus alone. To get the brown rot you want to go after the curculio. Mr. Hitt's experience exactly conforms to that. The Station at Mountain Grove issued a statement that if you spray your peaches for curculio you will keep down the brown rot. It does not pay to use Bordeaux mixture on peaches for brown rot.

Mr. Griffin.—After I used the Bordeaux mixture I used the arsenate of lead. I asked the question for information, as evidently the arsenate of lead has some value as a fungus spray. Where I quit spraying I quit gathering apples. I used ten or fifteen kegs of arsenate of lead.

Mr. Hitt.—In spraying peaches for curculio, the best results we got last year were where we sprayed with arsenate of lead, together with the self-boiled lime and sulphur. Too much of arsenate of lead will brown the fruit and foliage. We ought to be very careful about the grade of arsenate of lead we use. Mine came in one hundred pound kegs. I had two orchards to spray. The same men mixed the solutions, the same machine was used, and one orchard, where I used one keg of lead, the fruit was very badly burned. That one keg in that shipment was faulty. There was too much free arsenic in that one keg of lead. And right here is where I want to make an important statement—*we want to be very careful about the grade of arsenate of lead we use.* You can burn a peach much quicker than you can an apple. The spraying material in these two orchards was mixed exactly the same, it was applied exactly the same, strength and everything.

Mr. Lowmiller.—Does condition of weather, whether it is dry or rainy, have anything to do with burning of fruit and foliage after spraying?

Mr. Hitt.—No; I do not think the weather has much to do with it.

Mr. Lowmiller.—I got worse results last spring than I ever had, and I thought it might have been on account of the dry weather, but I guess I had the stuff a little bit too strong. This coloring of the fruit never seemed to hurt it until about the time it ripened, and then most of it fell off, so I believe we used it a little too strong.

Mr. Hitt.—With us every peach that was burned finally dropped.

Mr. Plank.—I certainly would not wish the people in this meeting to think they can raise peaches and spray with arsenate of lead alone. You want to hang on to the lime and sulphur—commercial lime sulphur, with two pounds of arsenate of lead for the first spraying. The second time we used arsenate of lead, and even in wet places we had no brown rot. Certain varieties, such as the Triumph and Pickett's Late, are much more subject to brown rot than the Elberta. Such varieties as the Georgia have curculio, but no brown rot.

CO-OPERATION.

(By E. N. Plank, Decatur, Arkansas.)

I have lived for the past fourteen years on a farm. I took a tract of timber upland, containing but 25 acres of cleared land, and have practically made my farm out of timber land. I have raised cattle, horses, sheep, hogs, poultry, and have grown wheat, oats, corn, rye and other crops. Starting with a small acreage of apples, strawberries and peaches, I have grown all these, so that I have been able to ship them in car lots. I mention this to show you that I have passed through the experience of every farmer who has started at the bottom. I have known the time when a silver dollar looked larger than a wagon wheel. I have known the time when the distance between them was months and months. I have seen the time when I did not know where I was going to get the money to buy seed and trees or to pay my help. So I have passed through all the experiences of those who started with a small beginning and have worked up.

Much of my success in later years has been brought about by co-operation. I want to say to you farmers that our calling is one of the greatest callings on earth, because we clothe and feed the world, and we who ought to be the most independent people on the earth are the slaves to all other classes. Imagine, if you will, two great balls rolling slowly down the planes of time, and a single file of farmers passing between those two gigantic balls, one man coming out with eye-brows seared, one with a finger broken, one with a toe off—that is today the condition of the farmers of America. Upon one side you have the trusts and upon the other you have the labor organizations, and you who produce the food and raiment for these classes are the slaves and the servants of these other two. And why is it? It is simply because you pass between these two great forces, single file. Were you organized, as is every other calling, were you banded together, were you marching like an army in solid phalanx, you would not be ground, as you are, between these opposing classes. It is because you are disbanded, attempting to combat all sorts of organizations single-handed.

There is just simply one method whereby the farmer is going to be lifted out of his present condition, and that is through co-operation. You see combination on every hand. Let us suppose the combined forces of several foreign nations were to declare war against the United States, and our President should issue a call for a million men, and he should say to them, "Take your arms and go out and battle against the enemy." What would be the result? You would be annihilated. In a business sense the farmer is annihilated today. Like a beggar he takes his wares to the

market and asks, "What will you give?" And like a beggar he goes to buy and asks, "What will you take?" You who produce the breadstuff of the world; why don't you sell it, as does the man who sells you a keg of nails or a roll of wire, or as does any manufacturer? They consider the interest on the investment—the insurance, the taxes, the labor, the salaries, the losses, and then fix a price. When you produce a bushel of wheat, a bushel of corn, a pound of beef or pork, do you go about it in an intelligent way and say, "My land is of such a value, I must have interest on my investment, my labor is worth so much a day, there are taxes, wear and tear on machinery and use of horses to be considered?" And then do you put a price upon that wheat or that beef as you should, and get it? No. You allow a lot of speculators to fix a price on these commodities. You could stop them speculating as well as fixing the price if you would. But you do not hang together; you don't vote together, or you would fill your legislative halls with farmers.

Why don't you have a parcels post, bank guarantee law, postal savings banks and free trade? Because you think it is better to be independent and a slave rather than to fight for your own personal interests and vote for them. All these things you can have. They are yours for the asking. No one is to blame but yourself, and no one is ever going to give them to you. We have had a commission appointed by the President of the United States to investigate country life, to investigate country schools, and what did they find? Inadequate schools, poor roads, no sanitary conditions and little done to furnish recreation and other amusement.

Go to the city, visit the man that handles your commodities. He will meet you with an automobile, take you about and show you the sights. Can you meet him with an automobile when he comes to your home? Possibly some of you can, but very few. When a farmer gets an automobile the fact is written up in the paper; it is considered something wonderful. Now, the farmer is the one who ought to have the automobile —the banker has it for pleasure, the farmer needs it for business.

There is just one method, and one alone, by which the farmer can accomplish the ends he should accomplish and give to himself and his children the blessings of life to which they are entitled, and that is by co-operation. The farmer's first imperative need and duty is co-operation in marketing his products in order that he may get a living price for what he produces. At Voltaire, N. D., there is a farmers' organization having its own building in which to transact business and to hold the meetings. The farmers meet in an upper room, and the basement is fitted up for children to spend the evening while their parents are engaged in the upper room. They have their grain elevator, insurance and

telephone companies, which are managed at Crosby. I don't think there is anything more necessary than to have a nice place fitted up where the farmers can hold their meetings. You pay out more in the State of Missouri for tobacco and liquor than you would to build in every township in the State a consolidated school house with a large hall that might be used as a place where you could gather for recreation and to transact your business matters.

We read a great deal in the papers today about the depopulation of the rural districts. Can we blame the people for leaving the country? Go out here eight or ten miles from the railroad, and what opportunity have you there for young people to have a decent good time? We hear a great deal in the cities about young people going astray. The same thing is going on in the country, only we don't hear so much about it, and what are you doing as farmers toward protecting your children and your neighbor's children? What are you doing towards making the farm life pleasant? Has your school house a piano, a play ground and a croquet or tennis grounds? I want to say to you, gentlemen, that the perpetuity of this Union does not depend upon our glorious Constitution, of which Gladstone said of its writing, that "the finger of God was there," and of which Napoleon said it was the greatest document ever penned by man; but it does depend upon the intelligence and the sobriety of the great mass of the people. I want to say further that our greatest interest does not lie in these great and glorious institutions like you have in Columbia, so much as in these rural schools where the great mass of people graduate, and where you will find neglect. But here is where you want to concentrate your interests. Here lie the hopes of America's future. Not that I do not believe in these great institutions for higher education. I do believe in them. I believe, like Emerson, that we should hitch our wagons to the stars. We should have something to make our young people ambitious, some guiding stars and some light-houses. We must first improve the district schools so that life in the country will afford more advantages to the young. This can be brought about by farmers working together and voting together for a single aim.

I want to allude now to some co-operative schemes. Those with which I am most familiar were not brought out by our heads, but by our necessities. We are engaged largely in growing fruit, and we have gone into growing strawberries on a large scale. When this industry was in its infancy the farmer took his berries to town and sold them to a dealer or shipped them by express to some city. As the industry developed the near-by cities had more than they could handle, and we were compelled to organize and load these berries into refrigerator cars so that in the place of being confined to two or three local markets the whole United

States was open to us. Our cars of berries today go east to Buffalo, north to Canada, west to Denver. Now, because we raise this commodity on so large a scale we buy our crates together in car lots, have our shipping shed and selling organization. When the berries are ripe, the grower takes them to the manager of the association, gets his receipt for them and goes home. The manager loads the berries into cars and sells them or consigns them to points throughout the country. As this industry developed in various towns in our section, we found that two or three towns were trying to sell or to consign to the same market, and then was organized what is known as the Ozark Fruit Growers' Association. That organization sells for the various local associations in Southwest Missouri and Northwest Arkansas, so that the local association is now simply an organization for buying crates, and for packing, grading and loading the fruit. Now, what has this co-operation done? It has developed that industry perhaps 50-fold, until it is now the greatest in our community—it has also established a better pack—results which could not have been accomplished except through co-operation.

I handled this fall 44 cars of peaches. If I had attempted to sell those peaches myself I would have neglected the picking, and worked myself to death. I gave my personal attention, together with two assistants, to packing the fruit. Three of us stood there superintending the packing all the time. I turned the selling of it over to the Ozark Fruit Growers' Association and, after paying them a commission, I am satisfied I received more for the fruit than if I had sold them myself. Every car was sold on track at satisfactory prices.

This is just simply one way in which farmers can combine. We have in our section a Farmers' Mutual Insurance Company, whereby we get insurance at cost, and pay only where there is a loss. We have our own telephone system. Four years ago I paid two dollars a month for a telephone; now I pay 25 cents a month and have better service and over more territory. These are things you can all have, and many more, if you want them. It may be more difficult to handle corn and wheat and cattle and hogs along the line of co-operation, but it is feasible. You must simply co-operate in a locality on raising a certain thing. If you are in a good corn producing section you know you should not sell corn. You are impoverishing your land. You should sell hogs. Organize a swine growers' association. Have a selling agent, and as fast as you get a carload, ship it out. When there is a brother hard up for money, lend him some until his hogs are ready to be marketed. In Gentry, Arkansas, the Fruit Growers' Association have a canning factory, and when the fruit will not do to ship it is turned over to the canner. Besides tomatoes, they can their cull apples and peaches. They also have an evaporator

They have a manager who sells all the fruit grown by the members. If you are in a section adapted to raising sheep, organize for the purpose. Improve your grade of sheep and sell your lambs and wool together. The same way with the wheat section or the growing of any other crop. You will never accomplish the results you should accomplish until you do it through organization. Can you think of a single article that you buy that does not come to you through an organization having fixed prices? Why is it you are able to stand against such a formidable array of organizations and trusts? It is because you work fourteen to sixteen hours a day. You work your children, who should be in school, and your wives work. If you were limited to ten hours a day you could not stand what you are standing today. I am speaking of our average farmer. Now, I presume I see before me an audience of representative farmers—farmers who have become in a measure aristocratic in their ways. You should go to your homes and act as a guiding star in your community, urging the farmers to join together and work hand in hand for the betterment of their conditions and when you have co-operated I see before you a bright and golden future, when you shall reap a just reward for your labor.

ORCHARD HEATING.

(By W. A. Irvin, Springfield, Missouri.)

I am going to tell you of my own practical experience, and I hope it will be of some benefit to some of you. Understand, I am an apple man; also, a box man. For the last four years I have been packing my apples in boxes. Last year I packed 4,500 boxes, and sold all of them. This year I packed 3,200 boxes, and have sold possibly one-half of them. If you put your good apples in boxes they will sell better than in barrels. Take your No. 2s and pack them in barrels. Never pack a Jonathan in a barrel. I divide my apples into Nos. 1 and 2. For several years I have sold my apples to a firm in Kansas City, my No. 1 apples, as I call them. Last year I sold the same grade of apples for $1.25 per box, delivered to storage, and this year I sold the same kind at $1.50 to the same firm, delivered to storage. I will say this, to any one who has a small crop, who has a small orchard and no experience in the business, pack a good honest pack and put them in cold storage and the apples will sell themselves. My culls I sell from the orchard at 20 cents per bushel. Neighbors come and get them, and so there is no expense to me whatever. This is almost all clear profit. I have six thousand trees, and I got 25 per cent of a crop on account of the frosts and freezes. Fifty per cent only was No. 1s.

When I speak of orchard heating I feel like a tenderfoot, although I had experience last year. Before that time I was lucky if I harvested three crops out of five. I will say this now, if I could not have something like orchard heating, I would sell my orchard or cut it down and get out of the business. We had three nights of smudging; Kansas had nine, and Colorado had eleven, and if they can save their fruit, why cannot we in the Ozarks? A great many fruit growers say that orchard heating is all right. "That you can conquer a freeze, but you cannot conquer a blizzard."

About eleven o'clock one night last year the Weather Service notified us that there was going to be a severe freeze. Now, I make my headquarters at my orchard during smudging time, during pruning time and during spraying and picking time. I had 3,000 smudge pots for protecting 6,000 trees. I lost out partly by not having more oil or additional pots. I had the pots lighted about eleven o'clock and let them burn until seven o'clock the next morning and then ran out of oil. I even had my men place two pots together when the oil got low, for that high wind would sometimes flit them out, and by placing the two together one would light the other. Had I not had these smudge pots I simply would have lost six thousand dollars, and what I could have saved had I had more oil to put in those pots would have been considerable.

Four years ago, experimenting with orchard heating, I used piles of straw or hay and allowed them to get saturated with water and used coal oil to light them. We saved some fruit that year in the draws.

Two years ago I had a brush pile one hundred yards long and six feet in diameter. I am one of those people who did not prune up properly. I had this brush pile, which was in the right condition for burning, and I telephoned my man at the orchard one night to begin and burn that brush pile in sections. He started the fire about 3:30 o'clock, and burning it in sections, he kept the fire up until about seven o'clock the next morning—until sunrise, when there is no danger of frost. By doing this we saved four or five hundred boxes of apples up in the draws. That proved to me without doubt there was something in orchard heating, and I fully determined that I would try it the next year. I got to examining different orchard heaters, and finally the idea came to me—why not make an orchard heater myself? I call my make the stovepipe heater. I have no patent on it, and anybody can take my directions and make them.

I simply took a half joint of stovepipe and put concrete in it at one end for the bottom. I put a bailing wire handle to it so that it would be easy to handle. I punched some holes in the pipe about three inches from the end and ran wire through these in order to make the concrete stronger and help hold it in place. The pipe I used was six inches in diameter,

FIG. 11. W. A. Irvin's orchard of York and Grimes apples, near Springfield, Mo. Photographed April 29, 1911. Orchard equipped with home-made heaters.

and I made these pots twelve inches high. Each pot holds one and one-half gallons of oil. I placed one to each tree on the north and west side, thinking that I could in this way protect the south and east side. There are forty acres in my orchard. The south side of the forty, Ingram trees are planted. On the east side were Ben Davis, Jonathan and Ingram. I found when I gathered my fruit that I had not saved the fruit on the east and south side. There should be a heater to each tree in the orchard. I believe in a large fire. I believe in putting in a great many heaters. They ought to be large enough to hold enough oil to burn seven hours. But for a severe blizzard, such as we had last year, it would be necessary to refill heaters, the size of mine, or to buy a larger heater.

I got a car load of oil at three cents a gallon. Crude fuel oil is the kind I bought. I filled the pots so that they would be ready when needed. The first night they burned I had no notice that there was going to be a freeze, but my man got excited and lighted them when there was no need for it. As soon as I heard of it I had him put them out. He did this by going along and throwing a wet gunny sack over the top of the heater.

The cost of making one of these heaters is as follows:

One-half joint of stovepipe 6 inches in diameter and 12 inches high	$0.05
Concrete for bottom	.08
Wire	.02
Labor	.02
Total	$0.17

I find they did fairly well. They would burn a little weak when almost all the oil was burned out, but most all heaters have this same defect. Some oils leave a residue. I used this asphaltum residue to paint them on the outside. I do not store my heaters. I just leave them setting out between the trees because they are thoroughly protected inside by this residue and with the asphaltum on the outside.

I do not like the electric alarm; time is too valuable. If one should ask me at what I value my time in the orchard, I should answer, one hundred dollars a day, because I have got to be there and see that the work is done properly and quickly. During the smudging season I value my time at $1,000 a night. Why? Because if I am there and see the work done I know the results. I have no use for the electric thermometer. If I trust to some one else I do not know whether the work is done properly or not. I have several thermometers that the Weather Bureau furnished me, and I placed these at various places in the orchard. These thermometers are tested by the government, and I place one where it is

subject to all the cold of the storm. Every fifteen minutes this thermometer was examined, as well as those I placed in the draws and at other places in the orchard. When the thermometers get down to 30 degrees, and they are falling, we get busy. I used eight men in firing those three thousand smudge pots. Our method for firing those pots was rather crude. We used equal parts of gasoline and oil; used No. 10 wire, three feet long, with a corncob stuck on each end. The men would dip the corn cob in this gasoline and oil and they could light the pots as fast as they could walk. Four of the men lived at the orchard, and the rest were neighbors. Those that were at the orchard started the lighting in the draws where the freeze was most severe. The eight men, inside of an hour, lighted those three thousand smudge pots. I will say that it was rather an exciting time to me. I paid these men 25 cents an hour for their services, with a promise of work during apple picking time. My experience is with good reliable smudge pots, good results can be obtained.

I found the cost of smudging not unreasonable. I figured the cost at about $300.00.

I packed thirty-two hundred boxes of apples, and they will average one dollar a box. The boxes cost me ten cents, picking and packing and hauling to nearest station cost ten cents, and freight on board at twenty cents a box.

I expect to put one heater to each tree this coming spring and have one thousand extra heaters made to place on the outside of the orchard. Now, if we do not have any freezes I simply lose the interest on the investment.

I have a tank in which I haul the oil to the orchard. The car is so placed on the track that by digging a little along the track, I can drive right under it and fill my tank. There is a two-inch pipe attached on the wagon tank, so when I get to the orchard I drive along between two rows, hang an orchard heater over this pipe and run it full of oil. The tank that I haul with holds three hundred gallons of oil.

I have a well in my orchard, and I ran the oil that I have left in this.

DISCUSSION.

Mr. Darche.—In the burning of those brush piles, was it the smoke that did the business?

Mr. Irvin.—No, it was not; you must heat your orchard just as you would this room here. I raised the temperature six degrees in my orchard by using the heaters.

Mr. Richardson.—How did you fix those cement bottoms in your pots?

Mr. Irvin.—I made slush concrete—two parts of sand and one of cement. You could use one part of sand and one of cement.

Mr. Richardson.—How thick did you make the bottoms?

Mr. Irvin.—One inch thick.

Mr. Flournoy.—Spraying is all right. In regard to orchard heating, I have only a few words to say. The story is short. I raise apples; I raise them as many times as anybody does; I've been in the business twenty years; I do not think orchard heating is necessary, particularly in the region where I live.

Mr. Griffin.—Last February I got very uneasy about the thought of losing my fruit. I concluded that I would try the orchard heaters. Then the question came up whether I should use oil or coal to heat these heaters. I could secure coal at $2.00 a ton. I found it would take $5.25 to get an equal amount of fuel in oil, so I concluded I would use the coal. I realized that if I had to refill those pots with coal, the venture would houbtless be a failure. I will say that my experience was not satisfactory, but I would no more undertake to grow fruit without orchard heaters than I would undertake to carry my own insurance on a building.

My trees bloomed very early. That made it necessary for me to prepare for freezes early. I placed the heaters in the orchard, put a little kindling in the bottom of them and poured coal oil on it, and filled up with coal. We got the heaters all fixed up and I was ready for old Jack Frost, but he did not come. We went on spraying, and in doing so we dampened that coal in the heaters and the kindling got wet too. For several nights I stayed up and watched out and I became excited one night and went around and poured oil over the coal and kindling. But the frost did not come this time either. The next night we had another cold night, and any of you who were out that night know what it was. We started out to light the heaters and we sure had a job on our hands. The coal was damp and was slow about burning. We didn't get all the heaters lighted, but what we did get to burn generated lots of heat. They burned till seven o'clock the next morning. In my young orchard on the west, where we could not get the heaters to burn, I never gathered an apple. But where the heaters did burn, I never saw the trees fuller in my life. They simply broke to the ground. Where you use heaters you had better prepare for more work in the orchard at gathering time.

My idea is that the best thing we can do though, is to figure on using oil, in order that we may be able to refill the pots when necessary. You simply can't do this with coal.

Mr. Bell.—What did your coal heaters cost you?

Mr. Griffin.—I got six thousand of them, and they cost me $600.00.

Question.—How much fuel did you burn?

Mr. Griffin.—A car load and a half.

Question.—How much coal did you burn to a heater in one night?

Mr. Griffin.—Forty pounds.

Question.—What is the best coal to use in these heaters?

Mr. Griffin.—Nut coal; but I used common soft coal.

Question.—Did you have covers for the heaters?

Mr. Griffin.—Yes.

Mr. Garrett.—I am one of the doubting Thomases. I live in Iowa. Last spring, when the indications for frosts came, I think one of my neighbors used six thousand gallons of fuel oil, but after using that amount of fuel the freezes continued. Freezes do not occur often enough to justify the expenditure of one thousand dollars to equip my orchard. If I can not grow fruit without orchard heating I will quit the business.

Mr. Richardson.—I want to say right here that I believe that orchard heating is an important factor in orchard management. My friend, Mr. Flournoy, said that it was not necessary in his section of the country. Please remember that there are places where it does not frost very often—and Mr. Flournoy's orchard is in a particularly favorable location. Those of us who do not have such location have to rely on orchard heating to make a success of fruit raising.

Mr. Shumaker.—My experience is that we feel very safe in almost any locality if we have heaters. We tried them only two nights last year. We used the Hamilton heater and burned eight thousand gallons of oil. After burning four hours the temperature was raised six degrees. I think one should use one heater to each tree. I think they are a splendid thing, and in sections where they have late spring frosts I think they are indispensable.

Mr. Riddell. I am authorized to buy a car load for our orchard, and think they are a good thing.

INSPECTION BILL INDORSED.

The Secretary of the State Board of Horticulture read a summary of a proposed bill providing for the inspection of nurseries and orchards and creating the office of State Horticultural Inspector. The full text of this bill may be found under the report of the Secretary, at the beginning of this book. Following the reading, the resolutions below were introduced by Mr. Richardson:

Resolved, That it is the sense of the Missouri State Horticultural Society and other fruit growers present at this meeting that the proposed inspection bill, read in our hearing, be approved; and, be it further

Resolved, That we second the efforts of the State Board of Horticulture to have the measure passed at the present session of the Missouri Legislature.

Moved its adoption. Carried unanimously.

REMARKS FROM DELEGATES AND VISITORS FROM OTHER STATES.

J. C. B. Heaton, New Burnside, Illinois, delegate from the Illinois Society.—"I have long desired to meet with the growers of the famous land of the big red apple. Illinois also has large orchards, and I will say if we can secure one good crop the markets will know of it. We have especially large plantings of Ben Davis. We have some very good orchard lands, and while our orchards may not be as extensive as yours, we have many good ones and many good growers. I am very glad of this opportunity to be with you, and I wish to extend an invitation to Missouri fruit growers to meet with us in December, at the time of our annual meeting."

C. O. Garrett, Adelphi, Iowa, delegate from the Iowa Society.—"I bring greetings from the Iowa State Horticultural Society and wish to say further that I have greatlyy enjoyed the meetings, and I am very glad that I came. I desire to invite you to send a delegate to Des Moines next December, at the time of our anual meeting."

H. C. Green, Hood River, Oregon.—"I am not an official delegate from any of our organizations, but am here because I formerly resided in Missouri, and so made it a point this year to visit Farmers' Week and attend the sessions of the Horticultural Society." Mr. Green then described some of the fruit growers' organizations of Oregon and assured the hearers that anything we could do to promote co-operation among our growers would be to their great advantage and materially contribute to their prosperity in the fruit business.

Dan Lowmiller, Parkville, Missouri, representative of the Missouri Valley Horticultural Society.—"I am always glad to attend the State Horticultural meetings. I never fail to learn something, and I greatly enjoy hearing the discussions and meeting with old friends. I invite you to meet with the Missouri Valley Society at some of its Kansas City meetings."

IN MEMORIAM.

WILLIAM GROVES GANO,

Parkville, Mo.

Mr. President.—In the performance of the sad duty your appointment has imposed upon us, gladly would we eschew the commonplace and the usual on such occasions, and pour out our grief in tender and sympathetic sentiments, in admiration of this good friend, patient worker and true man, who but lately passed on to his reward; but in this case words are inadequate to the task, though "we could write every letter with a tear, and every word with a sob of a broken heart." But remembering that a covenant God still reigns, fe should assuage our grief, and learn a lesson from his noble life.

William Groves Gano was born near Winchester, Virginia, October 6, 1839. Here his boyhood days were spent, and on October 7, 1861, being only 22 years old, he enlisted in the Union Army and served to the close of the war, a little less than four years. During this time he did duty in the District of Ohio, later in the army of the Ohio, in the army of the Cumberland, and was with Sherman in his march to the sea. His record shows he served in three campaigns, once as a scout, as railroad guard, in seventeen skirmishes, three sieges and twenty-three battles. He was present at Johnston's surrender April 26, 1865, and participated in the famous parade and grand review at Washington, on May 24. He was mustered out of service July 10, 1865, and settled in Springfield, Ohio.

Here, on April 2, 1866, he married Miss Naomi Hensel. The young couple at once moved to Cedarville, Ohio, and in 1867, to Parkville, Mo. Here nearly all his married life was spent, save the two years he superintended the planting and growing of that first great Missouri orchard—the Olden Fruit Farm—and here, on July 20, 1910, at the ripe old age of 71, he obeyed his Master's call, and yielded up his spirit to the God who gave it.

Of his twelve children, four are deceased, five are married, and three, one son and two daughters, are at home with the mother.

In many respects Mr. Gano was a remarkable man. In his youth his opportunities for an education were meager; but his native good sense never failed him. In the army he was not only a good soldier, but through

it all he was recognized as an upright, good man. Stone River, where he was wounded, Chickamauga and Lookout Mountain, are among the larger engagements in which he stood to the front—never failing to do his duty.

Coming to Missouri at such an early day, forty-three years ago, he was almost a pioneer in his chosen calling, that of a fruit grower; but in it he became a noted success. He wisely selected some of Missouri's best fruit land, and soon was known as one of the leading horticulturists of the State. The beautiful apple that bears his name was first presented by him to the State Society in December, 1883. In January, 1884, the Missouri Valley Society named it the "Gano," in his honor. In the following December the State Society, by the authority of Mr. Charles Downing, confirmed the name; and in 1887, through his generosity, assisted by such men as Messrs. Butterfield, Blair and Kaufman, several State Societies, and many local societies in Missouri, Kansas and Arkansas, received gratuitous consignments of a number of two-year old Gano apple trees. He was twice elected treasurer of the Missouri State Horticultural Society, and twice they called him by their votes, to the vice-presidency. His genuine modesty alone, kept him from further honors in this direction. He was a charter member of the Missouri Valley Society, twice elected its President, and was an active member at the time of his death. In these as well as a member of the Apple Growers' Congress, a National Society, and of the American Pomological Society, an International organization, he was always ready to do his part, and much more, when he saw work that needed to be done. Possibly only one other has helped to make more fruit shows for Missouri than he, counting from the first Kansas City fruit show, in the old Exhibition Building, and again at Roanoke—often in St. Louis, at New Orleans, in Chicago, at the World's Fair, down to the fine exhibition at Electric Park, in September, 1909.

He was a careful student of horticulture. In the nomenclature of both apples and peaches he was an expert. Always modest, he made no big speeches, but could always give clear-cut and valuable instruction on all the questions that arose in our meetings—for he was well posted. In these respects our loss is quite irreparable—for he had but few equals.

His large acquaintance among fruit growers extended beyond the State. All will miss that familiar but now absent face. One said, "I have known him for forty years, and I loved no man better, for he was always mild—lovable." Others of us have known him for twenty-five years or more, and can truly say he was a conscientious Christian gentleman. He was a genial companion, and a true friend. His neighbors say, "He was a good husband and father; a good provider, and a good man in his family, at all times patient, kind and forbearing." As a citizen he

was beloved by all who had dealings with him, for he was kind, affable, honest and fair in all his relations among men.

But he is gone. Grand old man, farewell! In the garden on the other side, wherein stands the tree of life, you now know as never here, how valuable has been your religious culture, your trials and your experiences in this life. Let us emulate his gracious example.

C. H. DUTCHER, Chairman.
L. A. GOODMAN,
D. A. TURNER, SR.

MAURICE BUTTERFIELD,

Lee's Summit, Mo.

Maurice Butterfield, nurseryman, of Lees Summit, Mo., died at Winona, Texas, on February 20, 1910, aged sixty-four years. He is survived by a widow and eight children: Miss Mary Butterfield, reporter for the Chicago Tribune, Chicago; Charles A. Butterfield, superintendent, Muskogee Park System, Muskogee, Oklahoma; Jesse S. Butterfield, landscape engineer, Missouri Pacific-Iron Mountain lines, Lees Summit, Missouri, Elmer C. Butterfield, superintendent Combination Orchard Co., Winona, Texas; Harry E. Butterfield, landscape gardener, Lees Summit, Missouri; Miss Anna and Alfred J. Butterfield, proprietors of the Farmington Nurseries and Greenhouses, Farmington, Missouri.

M. Butterfield came to Missouri in 1869 from Ohio, locating at Knobnoster, Johnson county. In 1884 he succeeded Robert Watson as proprietor of the Lees Summit Star Nurseries, in which he was interested until 1909. As a nurseryman, he was one of the chief disseminators of the Gano apple. He was prominent in the Missouri State Horticultural Society and the Missouri Valley Horticultural Society; active in the management of the Jackson County Fair at Lees Summit, and one of the original promoters of the present system of macadam roads in Jackson county. In 1897 Mr. Butterfield organized the Pelly river expedition and made a trip into the Klondike region. Upon his return home he located the Farmington Nurseries and Experimental Grounds at Farmington, Missouri, where he remained in business during the remainder of his life.

Maurice Butterfield was the soul of honor, modest and unassuming, and in every respect a good citizen, as evidenced by his works. Such men leave their impress upon the community in which they live, and upon the people with whom they come into contact. His good deeds will live after him, and he himself will never be forgotten. Such a man as this was Maurice Butterfield.

W. P. STARK, Chairman.
D. A. TURNER, SR.,
W. T. FLOURNOY.

S. R. WALKER,

Liberty, Mo.

S. R. Walker was born January 31, 1856, died November 2, 1910. Deceased was converted and joined the Baptist church when he was seventeen years old, and led a noble, Christian life. He was true-hearted and a man of many friends. Mr. Walker gathered the Clay county horticultural exhibit for the St. Louis World's Fair in 1904, which exhibit won a silver medal; and Mr. Walker himself won a silver medal on individual display of fruits and a bronze medal on blue grass. Deceased was married to Miss Minnie V. Lightburn, February 2, 1887. His wife, one daughter and two sons survive him.

PRIZES AWARDED FOR FRUIT, ETC.

Messrs. E. N. Plank of Decatur, Ark., and J. C. B. Heaton of New Burnside, Ill., who were appointed to judge the fruit exhibit held at Columbia, January 10-13, 1911, reported as follows:

Best collection of apples of not less than six nor more than fifteen varieties, exhibited by an individual, firm, county or local society:	
First prize, Neosho Commercial Club	$20.00
Second prize, L. J. Hartman, St. Joseph	10.00
Third prize, D. Lowmiller, Parkville	5.00
Best collection of five plates of Ben Davis:	
First prize, J. R. Wilson, DeKalb	2.00
Best collection of five plates of Jonathan:	
First prize, Neosho Commercial Club	2.00
Second prize, J. R. Wilson, DeKalb	1.00
Best collection of five plates of Winesap:	
First prize, J. R. Wilson, DeKalb	2.00
Best collection of five plates of Grimes Golden:	
First prize, Neosho Commercial Club	2.00
Best four varieties of winter apples for market:	
First prize, D. Lowmiller, Parkville	2.00
Second prize, Neosho Commercial Club	1.00
Best four varieties of winter apples for family use:	
First prize, D. Lowmiller, Parkville	2.00
Second prize, Neosho Commercial Club	1.00
Best three varieties of fall apples for market:	
First prize, D. Lowmiller, Parkville	2.00
Second prize, L. J. Hartman, St. Joseph	1.00
Best plate of seedling apple, good enough to be recommended:	
First prize, Neosho Commercial Club	1.00
Second prize, L. J. Hartman, St. Joseph	.75
Best single plate of Ben Davis:	
First prize, J. R. Wilson, DeKalb	1.00
Second prize, W. J. Wilson, St, Joseph	.75
Best single plate of Jonathan:	
First prize, L. J. Hartman, St. Joseph	1.00
Second prize, Neosho Commercial Club	.75
Best single plate of Gano:	
First prize, J. R. Wilson, DeKalb	1.00
Second prize, D. Lowmiller, Parkville	.75

Best single plate of York:	
First prize, D. Lowmiller, Parkville	$1.00
Second prize, W. J. Wilson, St. Joseph	.75
Best single plate of Grimes:	
First prize, L. J. Hartman, St. Joseph	1.00
Second prize D. Lowmiller, Parkville	.75
Best single plate of Ingram:	
First prize, D. Lowmiller, Parkville	1.00
Second prize, Neosho Commercial Club	.75
Best single plate of Winesap:	
First prize, J. R. Wilson, DeKalb	1.00
Second prize, L. J. Hartman, St. Joseph	.75
Best single plate of Missouri Pippin:	
First prize, Neosho Commercial Club	1.00
Second prize, D. Lowmiller, Parkville	.75
Best single plate of Wealthy:	
First prize, L. J. Hartman, St. Joseph	1.00
Second prize, W. J. Wilson, St. Joseph	.75
Best single plate of Maiden Blush:	
First prize, L. J. Hartman, St. Joseph	1.00
Second prize, Neosho Commercial Club	.75
Best single plate of Huntsman:	
First prize, J. R. Wilson, DeKalb	1.00
Second prize, D. Lowmiller, Parkville	.75
Best single plate of Rome Beauty:	
First prize, J. R. Wilson, DeKalb	1.00
Second prize, L. J. Hartman, St. Joseph	.75
Best single plate of Payne's Keeper:	
First prize, Neosho Commercial Club	1.00
Best single plate of Benoni:	
First prize, D. Lowmiller, Parkville	1.00
Best single plate of Willow Twig:	
First prize, L. J. Hartman, St. Joseph	1.00
Second prize, A. O. Wild, Sarcoxie	.75
Best single plate of Mammoth Black Twig (Arkansas):	
First prize, J. R. Wilson, DeKalb	1.00
Second prize, W. J. Wilson, St. Joseph	.75
Best single plate of Clayton:	
First prize, D. Lowmiller, Parkville	1.00
Best single plate of Minkler:	
First prize, Neosho Commercial Club	1.00
Second prize, D. Lowmiller, Parkville	.75
Best single plate of Genet:	
First prize, D. Lowmiller, Parkville	1.00
Second prize, J. R. Wilson, DeKalb	.75
Best single plate of White Pippin:	
First prize, W. J. Wilson, St. Joseph	1.00
Best single plate of Pennsylvania Red Streak:	
First prize, L. J. Hartman, St. Joseph	1.00
Best single plate of Babbit:	
First prize, D. Lowmiller, Parkville	1.00
Best single plate of Smith Cider:	
First prize, J. R. Wilson, DeKalb	1.00
Second prize, L. J. Hartman, St. Joseph	.75
Best single plate of Bell Flower:	
First prize, D. Lowmiller, Parkville	1.00
Second prize, Neosho Commercial Club	.75
Best single plate of Wagoner:	
First prize, Neosho Commercial Club	1.00
Best single plate of Arkansas Black:	
First prize, W. J. Wilson, St. Joseph	1.00
Best single plate of W. W. Pearmain:	
First prize, D. Lowmiller, Parkville	1.00
Best single plate of Wolf River:	
First prize, D. Lowmiller, Parkville	1.00
Best single plate of Delicious:	
First prize, D. Lowmiller, Parkville	1.00

Best plate of Crab Apples:	
First prize, Neosho Commercial Club	1.00
Second prize, D. Lowmiller, Parkville	.75
Best single plate of Keiffer pears:	
Second prize, J. R. Wilson, DeKalb	.75

Special prizes were awarded as follows:

Collection of Nuts:	
A. O. Wild, Sarcoxie	$3.00
Collection of vegetables:	
J. M. Dressel, Webster Groves	2.00
Three pounds of honey:	
J. A. Wisdom, St. Catherine	2.00

Plates of apples, as follows:

Haas, L. J. Hartman, St. Joseph	$1.00
Sopps of Wine, L. J. Hartman, St. Joseph	1.00
Summer Queen, L. J. Hartman, St. Joseph	1.00
Rambo, L. J. Hartman, St. Joseph	1.00
Lansingburg, J. R. Wilson, DeKalb	1.00
Lady Sweet, D. Lowmiller, Parkville	1.00
Red Romanite, D. Lowmiller, Parkville	1.00
Flora Bell, D. Lowmiller, Parkville	1.00

MISCELLANEOUS PAPERS.

HINTS ON PRUNING APPLE TREES.

(By Dr. J. C. Whitten, Professor of Horticulture, University of Missouri.)

Pruning apple trees cannot be reduced to a formula. No two apple trees are alike. Each has individuality with respect to shape and habit of growth. Even the man who prunes with the greatest skill cannot accurately tell another man how to prune an apple tree. Nevertheless, men learn of their own experience to prune quite successfully. The beginner is usually very much perplexed. He may go to the orchard with a man experienced in pruning. The pruner cuts off a limb here and there on the first which is approached, and remarks that the tree is properly pruned The novice comes to the next tree, confident that he now knows how to prune. He looks for limbs corresponding to those which were cut from the first tree by the experienced man. No such limbs are there. The second tree has a different shape. The problem is a new one. He passes the pruning instruments over to the man of experience and says: "Show me how to prune this one." Even by a day's work and a day of careful watching, no two trees are found which could be pruned exactly alike. What hope is there then for the man who would learn how to prune? Can it be taught? Not by a formula. There are, however, many principles underlying pruning, which, if understood, will greatly aid the novice in solving the problem of pruning each individual tree.

First, it should be borne in mind that apple trees are grown for the ultimate purpose of bearing fruit, and not essentially with the object of producing logs or wood. Fruit production and all that conspires to bring it about on the part of the tree may be expressed in the terms, "reproductive activity." Wood growth or the production of limbs and leaves and the thickening of the trunk are the result of "vegetative activity." In the apple tree, length, growth or vegetative activity is greatest at the ends of the main limbs or main trunk. Reproductive activity or the formation of fruit takes place on the fruit spurs or inner branches, which lengthen but little. It is of fundamental importance to bear in mind that there is a seeming conflict between vegetative activity and reproductive activity in an apple tree.

FIG. 12. Jonathan apple tree very much in need of pruning. The center should be opened up.

FIG. 13. Same as Fig. 12 after being pruned by the method employed by th manager of the Darby Fruit Farm at Amoret, Mo.

Whenever an apple tree makes excesive wood growth, it is not likely to fruit abundantly at the same time. Whenever, on the other hand, it produces a heavy crop of fruit, wood growth or vegetative activity is reduced. Of course, enough wood growth should be maintained to keep the tree in health; to keep it strong and to give extended surface for the production of fruit. On the other hand, vegetative activity should be kept sufficiently reduced that the majority of the growing points, especially on the inner branches, will not make excessive length growth. Whenever the inner branches or fruit spurs make excesive length growth, they cease to produce fruit. Not infrequently, a tree which is making excessive wood growth and consequently not fruiting, may be thrown into bearing by doing something which will check this excessive wood growth. Pruning is one of the ways by which vegetative activity and reproductive activity may be kept in proper balance. In order to have a tree fruitful, all its parts must have a proper amount of sunlight, air and room to grow. This is usually accomplished to a large degree by the shape given the tree when it is young.

Just the shape or density of head to give a tree depends largely upon the climate in which it is growing. It is an interesting fact to note that in a humid or foggy climate, apple trees are usually given a very open head, so as to admit much sunlight and air. In a very sunny climate, a denser head is maintained. In the foggy climate of Western Europe, apple trees are usually planted on a south slope to gather sunlight. In the interior continental climate of the United States, a northeast slope out of the burning rays of the sun is better. In Western Europe, not infrequently trees are trained to the south side of a wall to gather sunlight. In addition, their branches are trained out against the wall like the ribs of a fan, so that each limb is exposed to the full influence of the sun. In the interior portion of this country, rounder and denser heads are observed. Even in the seacoast or maritime climate of the United States, more open heads are used than is customary in the central west.

For Missouri conditions there are two principal systems in vogue upon which the shape of the tree is based. With the one system, the aim is to secure a straight central trunk or leader. In the other, the leader is cut out, and 3 to 5 main limbs are established at the point where the branching system of the tree is to form. In the former system, the main limbs are spaced at proper distances up and down the central leader. In the latter system, the 3 to 5 main limbs subdivide each year, forming additional limbs as the tree increases in size and age. The main leader system probably lets in less sunlight and air than does the open head.

The system of 3 to 5 scaffold limbs or main branches may be called an

"open head" system of pruning. So far as the shape of the tree goes, the aim in either system is to adapt the tree to the amount of sunlight and air which prevails. Branches which cross and rob each other of light or interfere, are cut out. Where branches are so numerous that they do not all have room to develop their fruit spurs well, a part of them should be removed. Enough light should be let in so that the fruiting spurs within the tree may grow green and healthy without pushing out a long growth of water sprouts.

Which of these two systems is better is a question of debate in this section. Perhaps a majority of our growers use the straight central trunk or leader. A few, however, are equally positive that it is best to cut out the leader and shape the tree with scaffold limbs. Skillful growers secure good results by either method. It is my judgment that one method may be better adapted to certain varieties, and the other method adapted to varieties of a different habit. Upright symmetrical varieties like the Ben Davis succeed admirably with a central leader, provided the branches are properly spaced. Perhaps the reason why so many Missouri growers employ the central leader is because most of our apple trees are of the Ben Davis variety. Non-symmetrical straggling growers like Winesap tend to shape themselves with scaffold limbs. With varieties such as these, it is possible that the open head or scaffold limb system is better. Jonathan is a symmetrical and upright variety. If trained with a symmetrical leader, however, its limbs frequently break down badly when the trees are carrying a heavy load of fruit. This variety consequently appears to succeed better when pruned to an open head, so there will be less breaking down of its branches.

Another factor connected with the shape of the tree should be taken into consideration in this section, and that is "sun scald." Sun scald is injury to the growing layer on the sunny side of the trunk or main limbs. It usually occurs in late winter. The coloring matter in the bark of the apple tree has the power of absorbing heat from the sun's rays on clear winter days. On the Experiment Station grounds we have found that a thermometer inserted in the growing layer on the north or shady side of an apple tree will stand at about atmospheric temperature day and night. A similar thermometer in the growing layer in the south side af the same apple tree will frequently register 25 degrees or more above atmospheric temperature when the sun is shining brightly. This alternate heating up of the south side of the trunk or main limbs during the day, and freezing at night during February and March, sometimes injures the growing layer. It is probable that the cells on the sunny side of the tree tend to grow a little on sunny days and become tender, so that they cannot stand subsequent cold nights without injury.

This sun scald may be avoided in two ways: first, by planting the tree so it will stand upright; and, secondly, by shaping it so its trunk and main limbs will be shaded by its branches.

Young trees, recently planted in the orchard, frequently tip to the northeast, due to the prevailing southwest winds and to the intense sunlight on its southwest surfaces. It has even been recommended to slant trees toward the southwest when they are planted in the orchard, so they will withstand the pressure of the wind and so the intense rays of the sun will not strike their trunk and limbs at a right angle. They may stand straight up, however, if properly planted.

Any young apple tree to be planted in the orchard has a "heavy side," no matter how straight or symmetrical it is. If the tree is placed across the hand when picked up for planting, it will be found that a certain side will turn down towards the hand. The pith is not in the middle of a young tree, because the annual growth is thicker on one side than on the other. The cells of which the wood is formed exert greater pressure in growing upon this better developed side. This is what causes the tree to have what may be called a "heavy side" or "stiff side." The side which turns toward the hand when the tree is balanced, should be planted toward the 2 o'clock afternoon sun, or a little west of south. By bending a tree, it will be found that it will bend readily toward the southwest or toward the side which rested on the hand in balancing. It resists bending in the opposite direction. Handled in this way, trees will not blow away from the southwest, and will stand upright. One year old trees will stand up straighter than two-year olds, which are heavily branched, for they catch less wind. In sections where trees tend to lean away from the southwest wind and sun they should not be set too deep. If the roots are set deep down in the soil where it is cold they do not start to grow quickly. If set with the roots shallow, the root system warms up and begins growth quickly. One must depend partly also upon new root growth to anchor the tree firmly in the ground. All this bears a relation to pruning.

The pruning of the root system at the time of planting is important. In the past it has been thought necessary to retain just as many and just as long roots on the tree as possible. This has been found to be a partial error. If a root is unusually long, it is likely to be bent up in the hole at the time of planting. The bended or twisted root cannot carry sap well to the tree above. The bend restricts the flow of sap as much as a crook in the garden hose stops the flow of water. It is better to cut off a long root than to bend it. The small fibrous roots usually die out in handling in any event. If they are dry and dead, it is better to cut them

off near the main roots to which they are attached. Dry, dead fibrous roots twist up like curled hair, and prevent the soil from coming in contact with the main roots, which are alive. Main roots 4 to 6 inches long are better than long roots twisted up in the hole at planting.

The time of year to prune is another question of some importance. There is an old adage that "one should prune in winter for wood and in summer for fruit." This is partly true. As a rule, pruning in winter when the tree is dormant results in excessive wood growth the following summer. Pruning in May or June, when the leaves are out, often checks wood growth or vegetative activity and tends to induce fruitfulness. As a rule, water sprouts are more likely to follow excessive winter pruning, while summer pruning, if excessive, may too greatly reduce the vitality or vegetative growth of the tree. Where trees are established in normal bearing habit, it is perhaps best to do the bulk of the pruning in February and March. This may be supplemented by some summer pruning, especially to remove water sprouts or diseased branches. If trees are growing vigorously and not coming into bearing as early as they should, judicious pruning in June often incites the formation of a crop of fruit buds for the following year.

It is better to prune judiciously every year than to neglect the trees for a time and then prune severely all at once. If the trees are properly shaped and the branches properly spaced during the first five years, it will rarely be necessary to remove many large branches later. Large limbs should not be cut off except where necessary. Trees should be so shaped that the pruning later on may be confined to smaller limbs. It is never best to cut off large limbs that will make a big opening in the tree, unless these limbs are diseased.

Pruning in this section may be a little more severe on the northeast side of the tree than on the southwest side. This is to avoid possibilities of sun scald, which has been described above. Heavy limbs on the southwest side of the tree tend to keep it weighted over against the southwest wind. Judicious shaping on the southwest side tends to prevent sun scald.

In pruning, a branch should be cut very close to its point of attachment, so the wound will heal over. If a stub or long knot is left, it will die back to the trunk or main limb to which it is attached. Such a wound cannot heal. This decaying stub may carry such diseases as "canker" down into the body of the tree and injure it. There is usually a slight bulge, called the collar, where one limb joins another. One should cut just at the edge of this collar, where the enlargement begins when removing a branch. Dead or diseased limbs should be promptly cut away at whatever time of year they are observed.

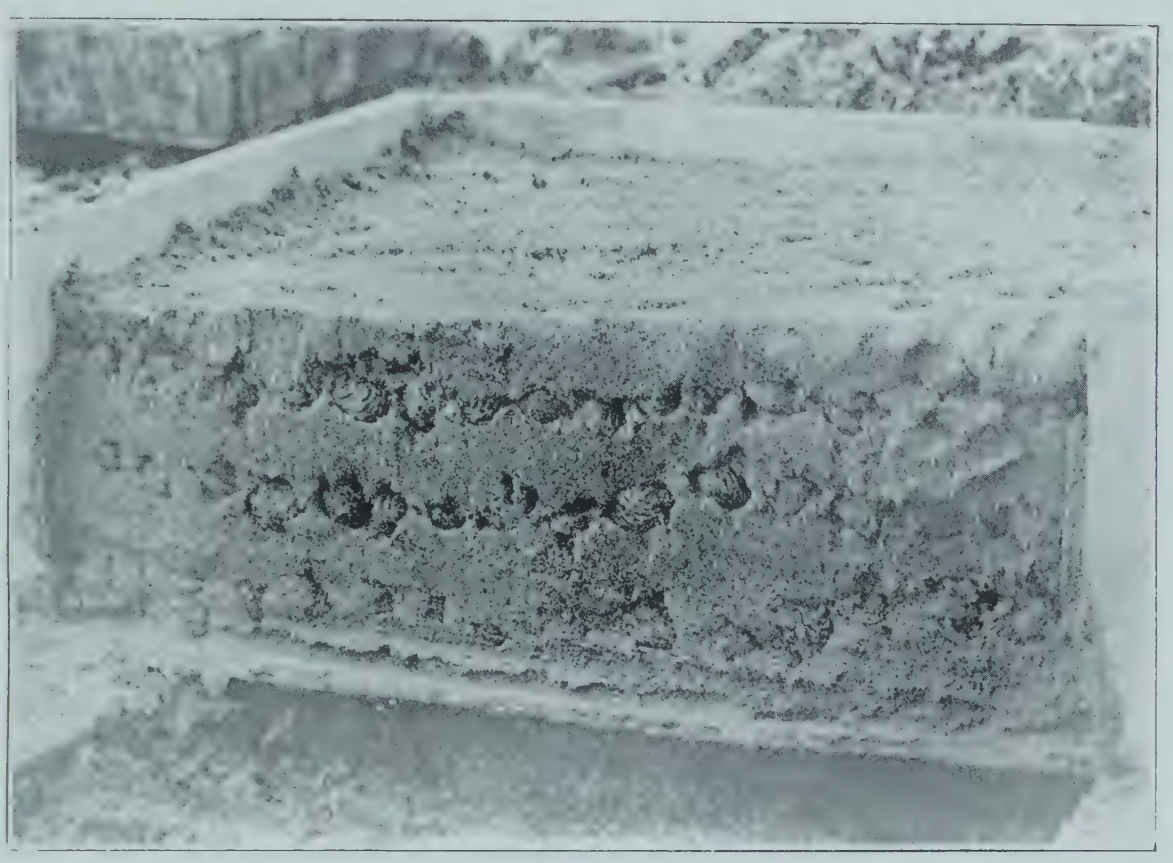


FIG. 14. Stratification of seeds. This picture shows peach seeds mixed with sand. One side of the box is removed so that the alternate layers of seeds and sand are plainly seen. The box of stratified seeds should be left out of doors all winter to freeze.

FIG. 15. A bunch of apple seedlings as they look when freshly dug. The seeds are planted in spring and the seedlings taken up in early fall. They are tied in bunches of 50 or 100 and stored away in the cellar in green sawdust until wanted for grafting. Before storage the tops are often cut off at a point about half way between the cord and the upper end.

All wounds over half an inch in diameter, made in pruning, should be painted. If the wounds are very large, two coats of paint should be given and the wound repainted every year until healed over. Common white lead and oil is probably as good a protection to wounds as can be applied. Any lead and oil paint which will well preserve the wood on the wall of a house is a good paint for covering wounds.

PLANT PROPAGATION.

DIRECTIONS FOR BUDDING, GRAFTING, LAYERING, MAKING CUTTINGS, ETC.

(By W. L. Howard, Professor of Horticulture, University of Missouri.)

All of our fruits and vegetables are multiplied or increased, either from seeds or buds. Nearly all of the garden vegetables are grown from seeds while comparatively few of the fruits are propagated in this way. It is true, that the fruits have their beginning with the seeds, but since the great majority of our fruits will not come true from the seed, we must resort to other methods of reproduction, such as grafting, budding, etc. In both budding and grafting, one bud, or more than one, are removed from the variety we wish to reproduce, and caused to grow upon the root or top of some other plant of a closely related kind.

In olden times the processes of budding and grafting were surrounded with great mystery as those possessing the knowledge of these forms of propagation desired to have it believed that they were possessed of supernatural powers. These methods of propagation are now well understood by everyone, and are so simple that a child may employ them.

There is no good reason why any farmer, if he so desires, may not propagate all of the fruits necessary for his own garden or orchard. Such work can be done at little or no expense, and, besides it is pleasant and interesting; particularly for the boys and girls of the family.

PROPAGATION OF FRUITS.

APPLES.

The apple is propagated either by budding or grafting. Grafting is the more common way, and is the method in most general use. There are two principal forms of graftage; first, the whip or tongue graft, usually employed in uniting a piece of an apple twig to a section of an apple root; second, the cleft graft, employed in top working either young or old trees in the field. In describing how to propagate apple

trees by the method of whip or tongue grafting, it is necessary to begin with the seed, and take up the different steps in the proceeding in their natural order. During the fall and winter collect some apple seeds from the fruit that is used about the house or from a cider mill, and mix them with sand in a shallow wooden box, which is placed out of doors on the north side of a building and left there all winter. The box should be open, so the rain and snow may keep the sand moist. The box should be set flat upon the ground in order to help retain the moisture. This is the process known as "stratification" of seeds. The box of sand should freeze and thaw as often as possible. The seeds are thus kept moist and the seed coats are caused to be softened, so that germination can easily take place when spring comes. Seeds with hard shells or coverings need to be frozen in order to crack them. Moisture is absorbed, and as the power of freezing water is very great, the hardest shell is forced open by frost. See Fig. 14.

When seeds are collected from a cider mill they must be separated from the pulp or pomace. This is best done by pouring the pomace into a barrel and stirring thoroughly with a stick. Some of the seeds will settle to the bottom at once. These should be collected by draining off the water. Many of the seeds cannot be released from the pulp at once by stirring. These may be collected a few days later by allowing the pomace to stand and ferment slightly. After fermentation has commenced, a vigorous stirring will usually release the remainder of the seed. Seeds may be separated from the fine particles of pulp by means of a sieve. This is tedious work, and is not necessary where the seeds are to be stratified shortly. After apple seeds have become dry, they must be stratified for at least a month to secure satisfactory germination. Sometimes seeds that are collected too late in the winter to be stratified and frozen are caused to germinate by placing them in warm water for one or two days, just before planting. Where apple seeds are stratified, it is well to cover the box with fine wire netting, to exclude mice. Bluejays are also sometimes bad to rob the seed boxes.

Seeds that have been stratified need not be disturbed until they are ready to be planted in spring at gardening time. Prepare the seed bed with care. Select a place where the soil is deep and fairly rich. It is very important that the soil be deep, so that the roots can go straight downward, for it is these long, straight roots that we are seeking to grow, and the longer and straighter they are, the better. Since apple seeds begin to sprout quite early, it is well to have the ground plowed the previous autumn. Plow deeply, and do not do anything more until spring. As early as the soil can be worked, the surface should be harrowed or

FIG. 16. This picture shows the location of good scion wood on a thrifty apple tree. Only the newest wood—that is, of the last season's growth is used for grafting of any kind. Note the new growth out on the ends of nearly all the branches.

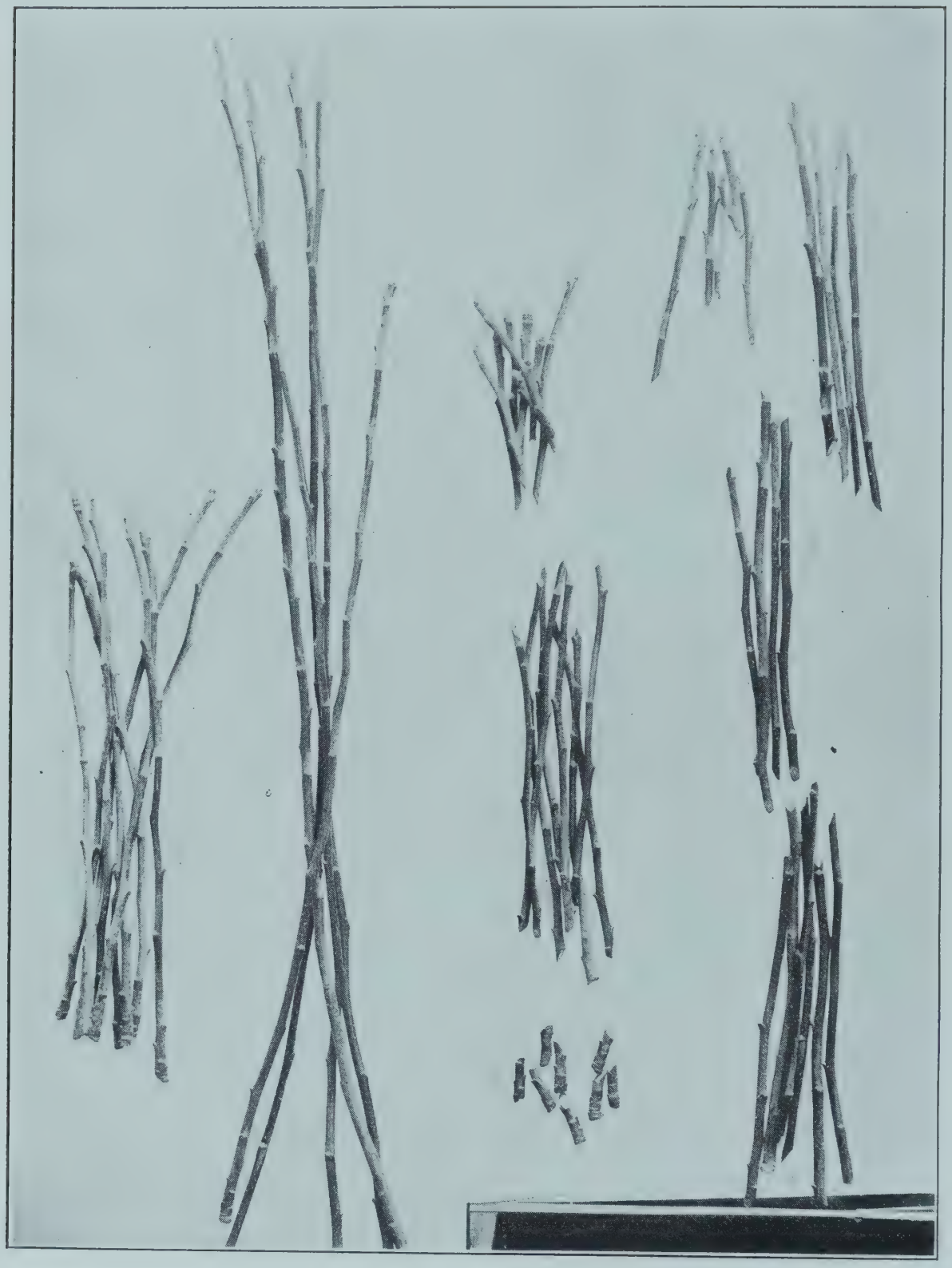


FIG. 17. Long and short scion wood. On the left are twigs just long enough to make one scion each, as will nearly always be the case where wood is taken from old trees that make only a slight growth each season. By the side of these is some long scion wood. The next figures show how the twigs are cut into scions proper, the short ones making one and the long ones three cuts.

FIG. 18. A bunch of well-selected twigs to be used as scions. Cut in fall and store in green sawdust until wanted for grafting purposes.

raked until it is quite even. Lay off rows four feet apart and sow the seeds about as thickly as garden peas in the rows. Instead of using soil, it would be a good thing to cover the seeds with thoroughly rotted chip dirt or barnyard manure. The seeds should not be covered more than an inch deep, and preferably less. Whether soil or compost is used for covering the seeds, the material should be free from weed seeds. If the spring is late, the seed boxes must be watched very carefully, as the seeds may begin to sprout before we are ready to plant them. If sprouting begins we must begin planting at once, even though the soil is too wet to work properly. However, if covered with fairly rich compost, as above mentioned, they will not suffer from planting when too wet, as such material will not bake. Give the little seedlings good cultivation by plowing and hoeing throughout the summer, thus keeping them growing vigorously. Late in the fall, after the leaves have dropped off, or by the first of November, whether the leaves are off or not, the plants are to be dug up, tied in bundles and stored in the cellar. (See Fig. 15 for seedling apple roots for grafting.) It may be necessary to strip off the leaves. If the tops are long, clip them off, leaving only about five or six inches of the part that grew above the ground, and pack the bundles in boxes with green sawdust pressed around them. Slightly moist sand may be used, but is not as good as the sawdust secured from freshly sawed green logs. Examine the boxes occasionally, and if found to be drying out, the sawdust should be sprinkled with water. These seedling roots are known as apple "stock."

Scions.—A scion is a twig from a tree which is to be used for grafting purposes. Scions for root grafting may be taken from the trees at any time after the leaves have fallen, but it is much better to cut them before the first hard freeze. Never cut scion-wood from trees while frozen. If cold weather comes on suddenly before the scions are taken, wait until they are thawed out. First, decide what varieties are wanted, then go to healthy trees of the desired kinds that are known to produce good crops, and cut from them the best twigs of the last season's growth. (Figure 16 shows the location of scion-wood on a thrifty apple tree.) Wood that is two years old is not suitable for grafting, although it will sometimes grow. Where scion-wood is taken from a young tree, it is often possible to get twigs as much as two feet long, but they can be used quite as well if the growth is not more than five or six inches, which may be the case with old trees. Fig. 17. Well-matured water sprouts are sometimes used. If water sprouts are taken, be sure that they are growing far enough above the ground to be certain that they have not come from the roots of the tree, which would make them seedlings. Never make the

scions of soft, spongy, immature wood, or from any which has refused to shed its leaves. If the scions are taken in fall or early winter, they must be packed in green sawdust and stored in the cellar like the stock (roots). Fig. 18.

Scions should not be permitted to either freeze or dry out while in storage. It should be remembered that when fruits are grafted, the variety is determined by the scion. As a rule, the root has little or nothing to do with determining the size, color, shape or taste of the fruit. However, the vigor of the root does have a great deal to do with the size and longevity of the tree that results from the scion that is grafted upon it.

Where a long scion and a short piece of root are used, the former will very likely take root itself above the stock. By many, this is considered to be highly desirable, and in such instances it is said that the trees are "upon their own roots." Where a long root is used with a very short scion, the point of union will be so near the surface of the ground that there will be great danger that sprouts will arise from the roots which, of course, would make seedling trees.

Making the Grafts.—The grafting is best done in a cellar or basement room or may be performed in a moderately warm living room, if precautions are taken to keep wood from drying out. Keep packed up until ready to use, and repack as soon as the work is over. With the exception of the few pieces that are being handled, the remainder should be kept covered up with a piece of moist cloth. Do not work about an open fire or near a hot stove, as both the roots and twigs may be dried out and seriously injured. Grafting may be done in January and February, and even as late as March. But February is considered to be the best month.

Ordinarily, the scions for best root grafting are from six to seven inches long, but they may be made shorter if necessary. On the large end of the scion, make a sloping cut an inch or an inch and a half long, as shown in Figs. 19 and 20. Use a sharp knife and make the cut smooth and uniform. On the surface of the sloping cut, from one-fourth to one-third of the way from the end, make a slit or tongue by a downward cut. The tongue should be an inch or more in depth, partially following the grain of the wood, and partially across the grain, so that the twig does not split. Professional propagators form the sloping cuts, make the tongues and then cut off the scions of the desired length. Next take one of the long seedling roots, shown in Figure 15, and follow the same process of making a sloping cut and a tongue. Begin at the crown (the part of the root which was just at the surface of the ground), and make the cut so that all of the root and one-half inch or so of the top are used. The oper-

ator should learn to be very economical of the seedling roots, and make them go as far as possible. On the other hand, it will not do to leave too much of the part that grew above ground on the root or stock, as the buds would be very likely to grow, thus keeping the scion from forming a tree. In this case, the tree that was formed would be a seedling. In making the sloping cut upon the root or stock, care should be taken to see that it and also the tongue, are as near like the slope and tongue on the scion as it is possible to make them. Particularly is it necessary that the slit for the tongue be started at exactly the same distance from the end on both scion and root. The root is now cut off about three inches long and the process repeated until the entire seedling root has been used. If the seedlings made a good growth and the soil was porous enough to let them go down properly, each root will usually make about three pieces. Consult Figs. 19 and 20.

Join the root and scion by placing the two sloping surfaces together and causing the tongues to interlock. Just here the main thing to be observed is to watch one side and see that the bark line of the scion comes exactly into contact with the bark line of the root. This is highly important, for here is where the two are to grow together. The scion and root may not be of the same thickness; in fact, seldom are, but this makes no difference if the above instructions are followed. (See Fig. 19.) If the tongues of both scion and stock are of the same length and were started at about the same distance from the end of each piece, they will exactly fit. If one of the slits has been started too low down on the face of the sloping cut, this will be shown when the two pieces are fitted together. For example, suppose the tongue was started too low down on the stock, but at the right point on the scion. When the two are put together it will be found that the sloping part of the stock will overlap on the scion far beyond the cut surface where it is intended it should fit neatly. This is very bad, as a wound will result, and such a wound cannot heal. To grow together, the two cut surfaces must be in intimate contact so that their cambium layers on at least one side will touch. If a cut surface is in contact with the outside of a bark surface, as in the example cited above, it is easy to see that the parts cannot unite. An open wound under ground is as bad as a wounded place above ground, for both invite disease organisms. See right hand side of Fig. 19.

After uniting the scion and stock, it will be necessary to wrap the point of union with No. 18 or 20 cotton knitting thread. Holding the graft in the left hand with the root part forward, the thread is laid upon the wood near the end of the cut, wound two or three times around at this place, at the same time pressing the parts together tightly with thumb and

finger. Next work the thread up to the other end of the cut by winding it two or three times around the graft during the distance, then two or three times around the other end of the cut, as in the beginning, and fasten the end, not by tying, but by drawing it down into the cut and by a sharp jerk, breaking it off. This completes the process. The finished graft should be from seven to nine inches long. (Fig. 19.) Some people

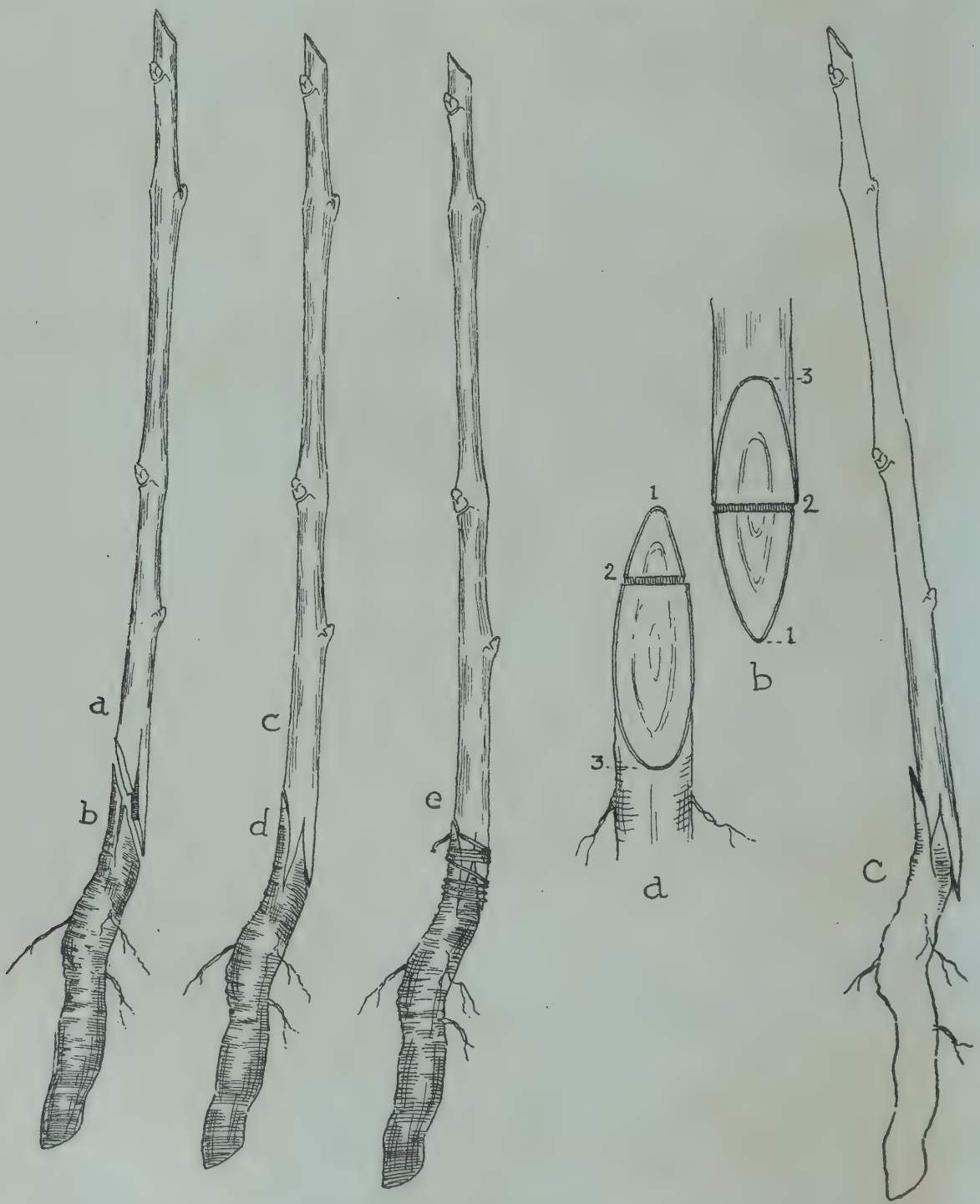
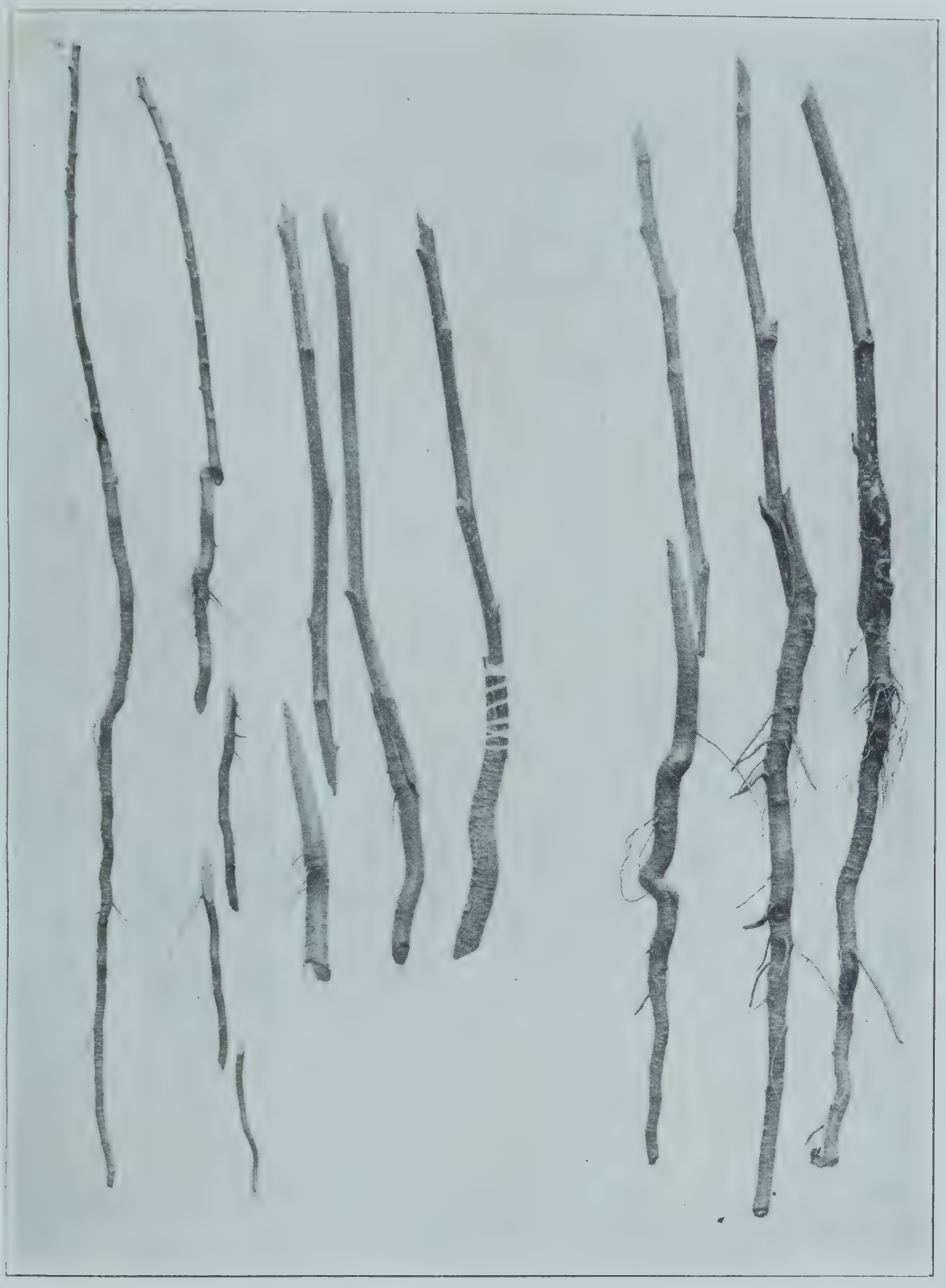


FIG. 19. Propagating apples by piece root grafting. In the first on the left *a* represents the scion and *b* the root or stock. Note how tongue is cut in each. In the next picture *c* and *d* shows the scion and stock properly fitted together, and *e* illustrates how they are tied with No. 19 cotton knitting thread. Not necessary to wax or even use waxed thread.

The remainder of the picture—the three figures on the right, show what happens when the tongues on scion and stock are not made alike. In *a* the tongue is about right, but in *b* it is started entirely too far from the end to match. When made this way and fitted together the pieces overlap and form a very bad union as shown in *c*.



a *b* *c*

FIG. 20. Apple and pear grafts. At *a* are shown a good No. 1 apple seedling, whole, and the same cut into three pieces for piece root grafting. At *b* is shown the complete process of making apple grafts.

The three pictures at *c* on the right illustrate how pears are grafted. The pear root must not be cut into pieces, but must be used practically whole. The scion is about four inches long—much shorter than for apples. The pieces are joined together as in apples and tied in the same way. The entire wound must then be covered with grafting wax.

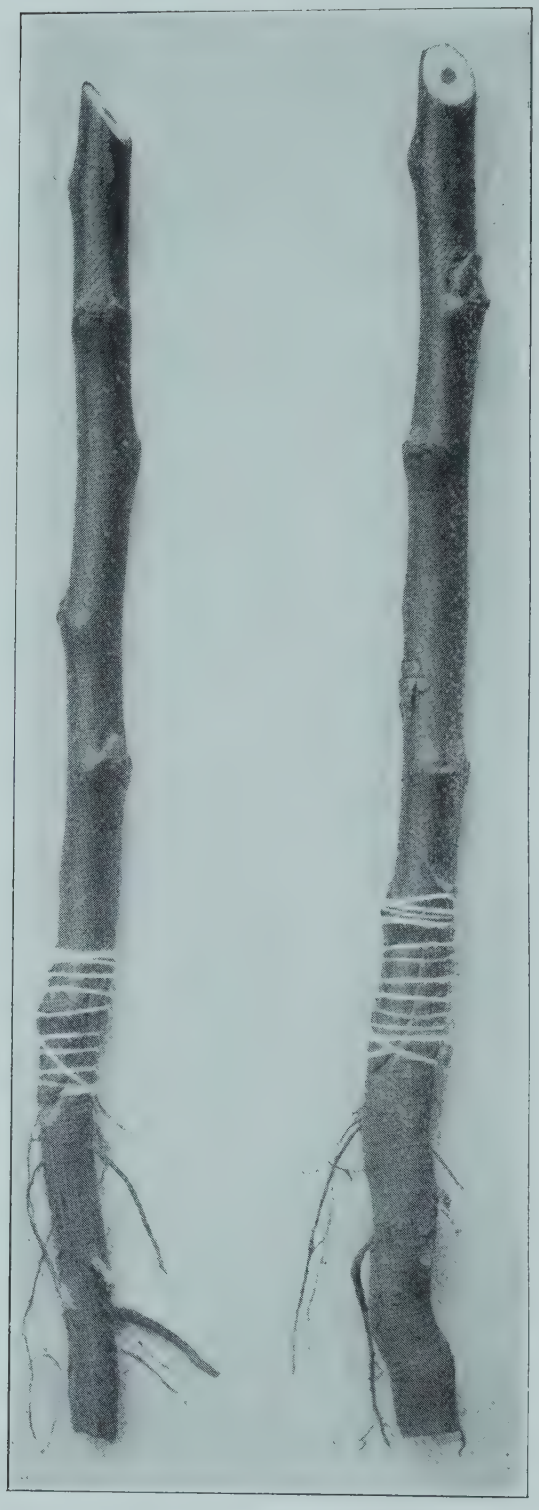


FIG. 21. Photograph of apple grafts as commonly made.

prefer to dip the ball of wrapping thread in hot grafting wax before using. If this is done it is not necessary to fasten the end of the thread after wrapping, as the wax will hold it in place. The old way was to thoroughly wax over the point of union after being wrapped with a string. Some also went so far as to wrap with a piece of waxed cloth, but these precautions are not considered to be necessary.

Whole-root grafts are widely advertised. This is the trade name for grafts that have been made by using roots four to six inches long. Seedlings that have not formed long tap roots may be economically employed in whole-root grafting. (See Fig. 22.) It is not practical, and also is unnecessary to use entirely whole roots, where the latter are very long, in root grafting. In the first place, it would scarcely be possible to dig the seedling without destroying a portion of the tap root, and even if this could be accomplished, it would not be feasible to plant such grafts after they were made as they would be two feet or more in length. In many instances, there is no doubt but what grafts upon moderately long roots will make better trees than where very short pieces are used. However, very much depends upon the character of the soil and the season in which grafts are grown. With proper handling, good trees may be grown with short pieces of roots for stock. Owing to cheapness as well as ease in handling, the writer prefers a scion six or seven inches long and a section of root about three inches long. Figs. 19, 20 and 21.

In wrapping apple grafts only just enough thread should be used to hold the parts firmly together until planted. It is a mistake to wrap with thread that is too strong, or to use too much of the right kind of string, as such binding material will not decay quickly enough. If the thread does not decay when growth begins after being planted, the tree at the point of union will be girdled or ligatured, thus creating a wound which is a menace to the health of the tree. This is the objection to using waxed thread, as the wax may prevent its decaying at the proper time.

Pack the grafts in bundles of fifty to 100 each and store in green sawdust, where they are to be kept until planting time. While in storage, the cut surfaces which have been joined together will actually begin to heal over and partially begin to unite, and on this account, the grafts should not be disturbed until they are taken out for planting. Keep the boxes of grafts in a cellar or moderately cool room. They should not be permitted to freeze, and neither must they be allowed to dry out. Examine frequently and sprinkle the sawdust a few times if necessary to keep moist. If the room is warm and the sawdust is kept moist, the grafts will certainly begin to grow at least a month before they can be planted, which will injure them very greatly.

Planting.—As soon as the ground will do to work in the spring, select a place where the soil is moderately rich, but not extremely so, on which to plant the grafts. Plow the land deeply, and otherwise prepare as for a garden spot. The rows should be perfectly straight in order to facilitate close cultivation with the horse cultivator. Use a line or wire for getting the rows straight. The rows should be four feet apart. The planting may be done by either of two methods. Where a large number of grafts are to be planted, a furrow is opened with a small turning plow. The grafts are then stood up along the vertical side, and the earth thrown against them with a plow or by hand. Where only a few grafts are to be planted, the other method is to make holes about eight inches deep with a wooden pole properly sharpened for the purpose. A long, round bar of iron is sometimes used, but is rather too heavy for convenience. In making the holes, the pole should be carefully withdrawn from the ground with many side movements, so that the soil will not fall in.

Plant the grafts deeply. After placing them in the holes or in the furrow, there should be only one or two of the buds of the scion left above ground. This makes it necessary that the ground should have been plowed deeply. The most important operation of all in planting is to be certain to press the soil up closely against the roots of the grafts. Where grafts are planted in holes and not in a furrow, the soil is best pressed up against the lower part by means of a "dibber." This dibber may be made by sharpening a piece of hoe handle to a long point and attaching to the top of the handle a cross piece for convenience in handling. An ideal dibber is made by using the end of an old spade handle containing the hand piece, together with eight inches or so of the handle, properly sharpened to a point. See Fig. 23 for a plain dibber without special hand piece. The dibber is forced down in the ground by the side of the graft and the soil pressed up tightly against both root and scion from bottom to top. Fig. 23 shows how planting is done.

The grafts cannot grow if air spaces are left around the roots. Here is where more people fail than at any other point. Large growers of young apple trees are disposed to plant most of their grafts in furrows for the reason that it is next to impossible to get workmen who will do the work of planting properly by the other method. Give the little trees good culture, including two or three hoeings during the summer, and with a fair season, they will make a vigorous growth, and attain a height of from two to three feet. In rich soils, they will grow even higher. If trees are to be left until they are two years old before transplanting, it will be necessary to go through the nursery early the following spring before growth begins and carefully trim off all branches that may have formed up to a height of 24 inches.

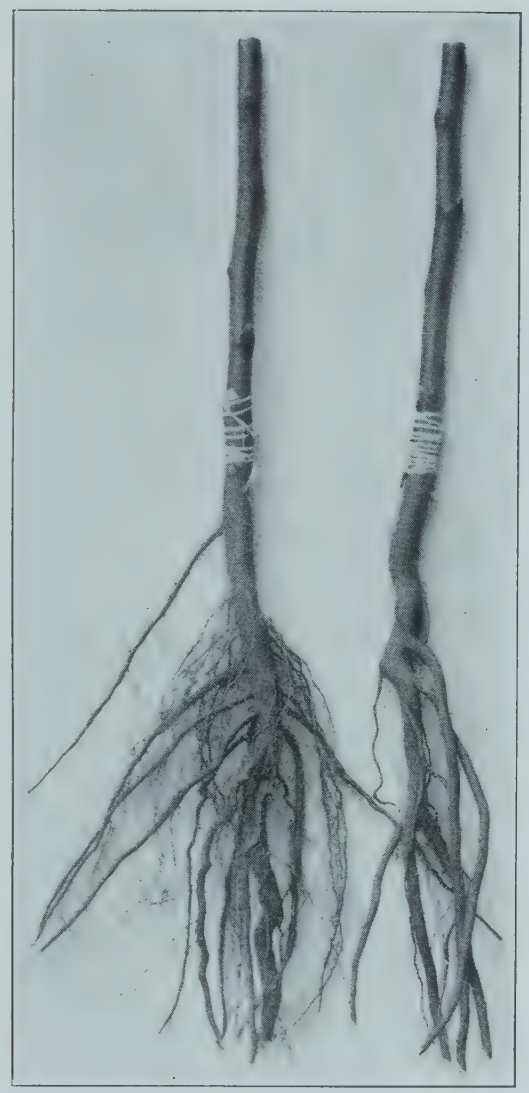


Fig. 22. Whole-root apple grafts. Here the scion is short, but the stock or root is long. The side roots are generally trimmed off as a tap root five or six inches long is all that is necessary to make a good nursery tree.

FIG. 23. Planting apple grafts. The soil must be pressed tightly against all parts underground. Use a dibber for this purpose as shown in the illustration. The second graft from the left hand side is improperly planted, as there is a large air space at the bottom. The last one on the right is correctly planted—in contact with the soil throughout.

The trees may be set in the orchard after one season's growth, particularly if they have attained a height of two to three feet. If the soil has been fertile and cultivation good, they will occasionally grow four feet the first season. A one-year old tree, three feet in height, would be ideal for planting. In the past, particularly in the middle west, it has been customary to allow the trees to stand two years in the nursery before transplanting to the orchard. However, there is now a growing sentiment in favor of planting one year trees, as they can be grown at less cost; are more easily handled, and more economically planted. Trees may be transplanted to the orchard in the fall if there has been rain enough to make the ground moist. South of the Missouri river, fall planting is very desirable if the ground is in proper condition. The majority of the planting is usually done in the spring, which is usually the most satisfactory, especially in the north. If it is known that other work will be pressing in the spring, so that the work of planting apple trees is likely to be hurried or otherwise improperly done, then they should always be planted in the fall when more attention can be given to the work.

The whip or tongue graft is sometimes employed for top working very young trees, particularly those that are only one year old. For trees of this age, this method is regarded as being better than the cleft graft. Tie securely and cover with wax. See Fig. 30.

Cleft Grafting.—While the whip or tongue graft described above is the method in most general use among nurserymen for the propagation of apple trees, there is another form known as cleft grafting that is used very extensively by farmers and others who have only a few trees. A knowledge of cleft grafting is especially useful where one has an apple tree that has reached bearing age and is found to be unsatisfactory, either in the kind or quantity of its fruit. The tree may be cut down if not too old, or regardless of age (if large enough), its branches may be sawed off and the desired variety of apple inserted upon the stump or stumps. More people will have occasion to use the cleft graft than the first method described.

Cleft grafting is sometimes employed on other trees besides the apple. This method is also sometimes called top grafting. As many varieties as there are branches to work them upon may be top grafted upon a single tree. In fact, there is no reason why summer, fall and winter apples may not be grown on the same branch or adjacent branches. It is a matter of great curiosity to see apples of different colors and sizes growing upon the same tree, but such a mixture would be of little practical value, as there would not be enough of any one kind of fruit to amount to

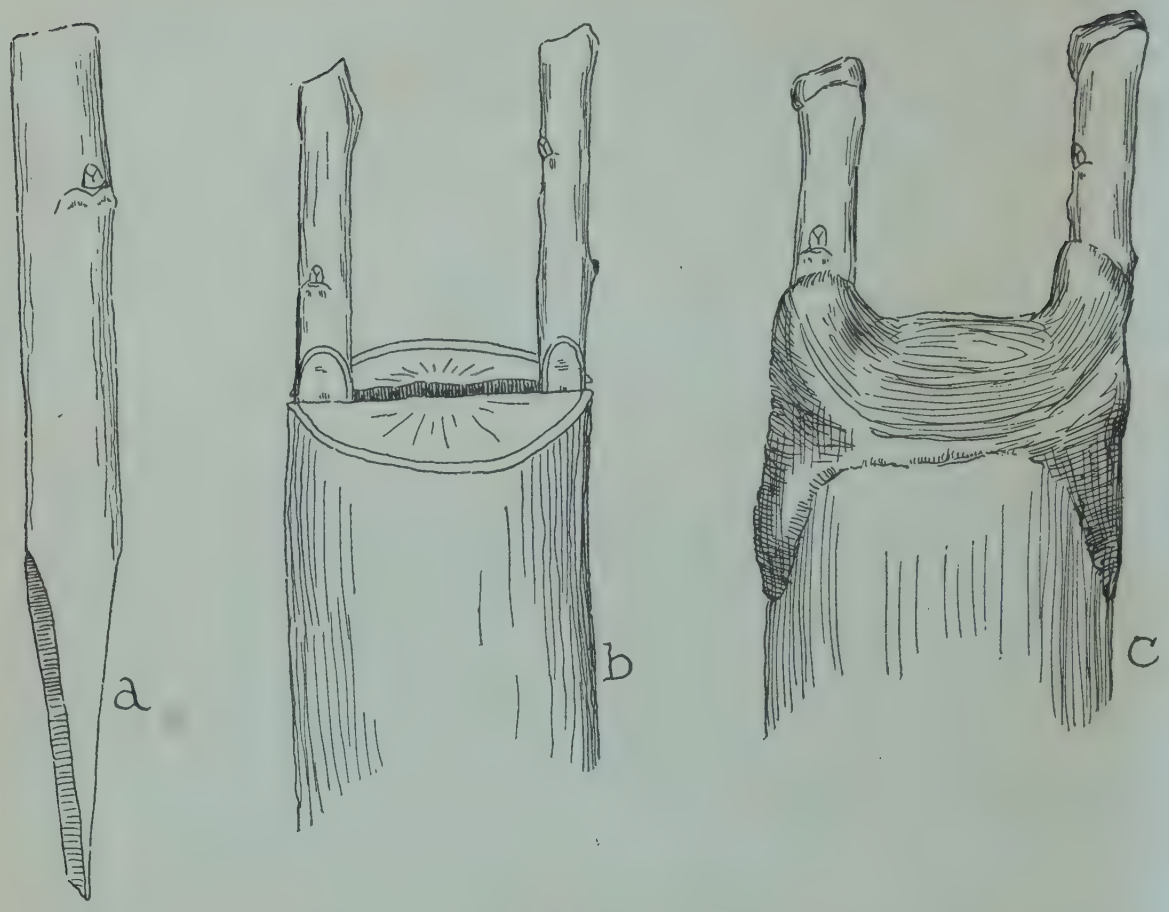


FIG. 24. The cleft graft. The short scion (about four inches long) whittled to a wedge shape, is shown at *a*. The middle figure, *b*, shows how the stump or branch is sawed off and split, and how the two scions are inserted. Note that the inner part of the bark of the scion is exactly in contact with the inner bark of the stock. The last figure, *c*, illustrates how all cut surfaces must be thoroughly covered with hot grafting wax.

much. New varieties may be hurried into bearing by being worked upon the branches of an old tree. Weeping forms of trees like the mulberry, ash, elm and others, are often top-worked upon upright growers by cleft grafting.

It will be necessary to collect the scions for cleft grafting early in the winter before severe freezing weather, and store them in the manner described under the discussion of whip grafting. The work of cleft grafting is done in late winter or early spring. Top grafting of apple trees is more successful if done before growth starts, but where only a few trees are to be worked, the operation may be delayed until after the leaf buds are just beginning to open. Regardless of when grafting is done, the scions must be perfectly dormant. To do the work, saw off the branch if as much as an inch in diameter or even the body of the tree, if it is not more than three or four inches thick, and split the stump down the center with a knife or hatchet. The scion, which is the same kind of wood described for other scions, should be only four or five inches long. The lower end is whittled on both sides to a wedge shape. In making the

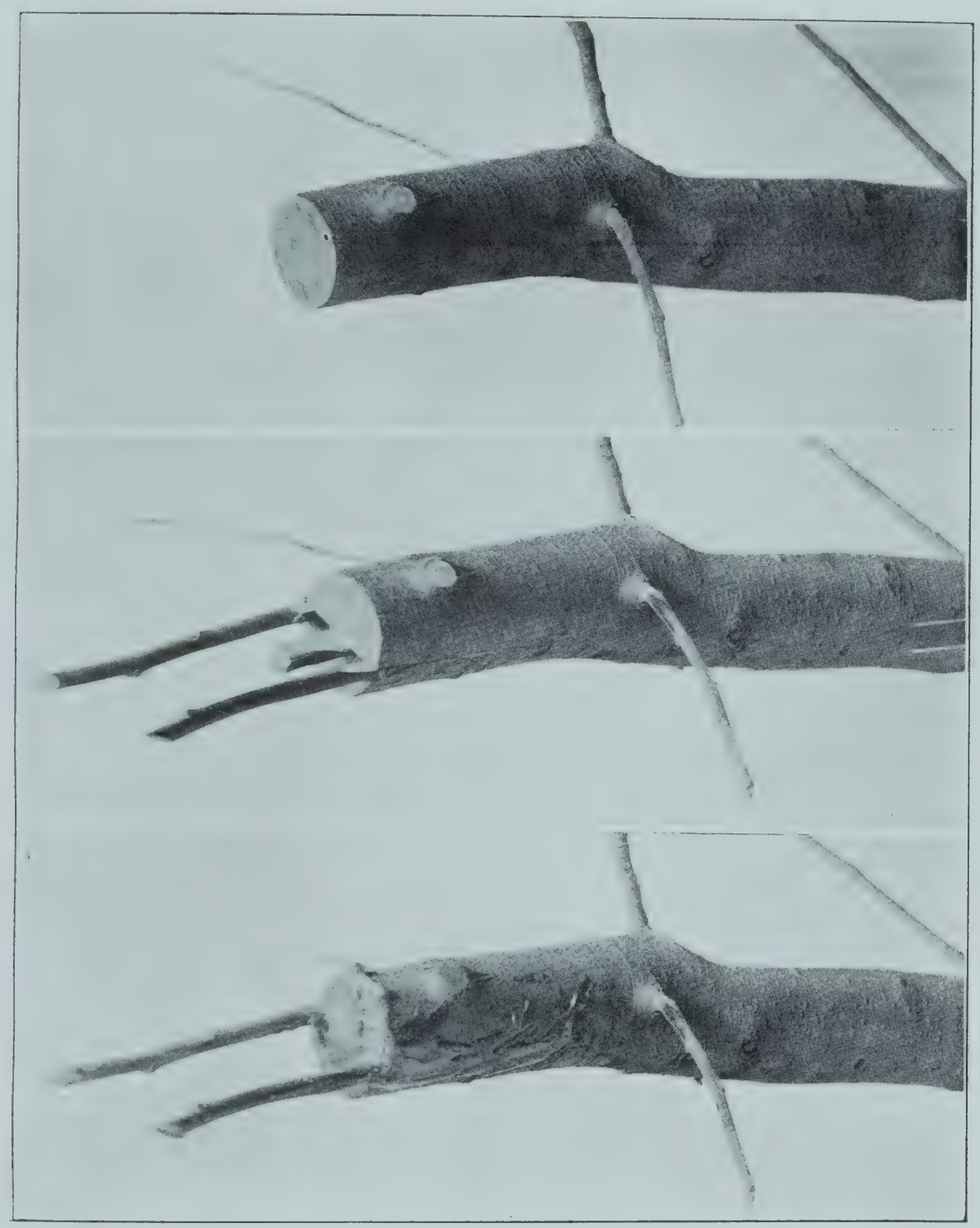


FIG. 25. Photographs of cleft grafts on apple. The top figure shows the branch or trunk sawed off and ready to be split for grafting. The next shows the two scions correctly inserted in the cleft with wedge to prevent their being crushed. The last shows the wedge broken off and the entire wound covered with grafting wax.

FIG. 26. A tree that was afterwards top grafted in order to change the variety. (Photographed by J. F. Riddell, Manager of the Darby Fruit Farm, Amoret, Mo.)

wedge, the slopes must be long and uniform—care being taken to whittle the same amount of wood from each side. Sometimes the branch or trunk, if as much as three or four inches in diameter is split through the center in two directions, thus making room for four scions. Instead of splitting the trunk or branch through the center, many people now prefer to make the cleft toward one side so that the split part involves only the outer part of the sap wood. Such a method would not cause such a large wound, and on this account, it is now preferred by many good propagators. See Figs. 24 and 25.

As explained, the slope on the scion must be long and uniform. Pry open the cleft in the trunk or branch to be grafted and carefully insert the scion so the bark of one side will be exactly in contact with the inner part of the growing part of the bark of the stock on that side. This is extremely important, for here is the place where they are to grow together, and they cannot do so unless the inner bark of one piece is exactly in line with the inner bark of the other. If the old branch or trunk of the tree is large enough, that is, thick enough, it is advisable to use two scions, one at either side of the cleft, as this will double the chances of success. The same principle is followed where four scions are used.

If the grafted stump be as much as three inches thick, a wedge for the purpose should be made of pine, or almost any other wood, and driven down in the center of the cleft, just far enough to relieve the great pressure which would otherwise be exerted on the scions, but yet not far enough to cause them to be loose. After being driven down to the proper point, the wedge may be broken off even with the top of the stump. Note Fig. 25.

When the scions and wedge are in place, it will be necessary to cover all cuts and cut surfaces with hot grafting wax. The wax may be melted in a tin pan at the house and carried to the orchard if not too far away. It is best to prepare a small wooden paddle with which to dip up the molten wax and spread it over and around the scions, in such a manner as to entirely exclude the air, and thus keep them from drying out until they unite with the old wood. This wax should never be disturbed afterward, as it will not injure the tree. If more than one scion grows, by all means cut them off. If two scions are allowed to stand, a forked tree will be formed, which is always to be avoided.

Old apple trees may be top worked to other varieties and entirely renewed by means of cleft grafting. If trees are ten to twenty years old, all of the branches cannot be cut off and grafted at once. Perhaps four-fifths of the branches may be top worked to the desired variety in one season, and the remainder the next season. In old trees the growth which

results from the newly inserted grafts seems to require some protection from sun and wind. A few old branches are left for this purpose. Furthermore, the old branches are necessary, as the tree will be in need of more foliage than the grafts could supply in early summer to carry on the necessary vital activities which it is the duty of leaves to perform. The chief duty of such leaves, in fact, is to feed the roots. Figs. 26, 27 and 28.

In top working vigorous growing trees of from three to five years' growth in the orchard, the trunk is often cut off a foot or so from the ground and cleft grafted. The one scion that is permitted to grow pushes upward so rapidly as a result of the pressure of the large root system of the tree, that it is in very great danger of being blown off during the summer. In such cases, it is nearly always necesary to drive down a stake to which the little top of the tree may be bound for greater security. Fig. 29.

Another form of cleft grafting which is coming into general use in the west and northwest is somewhat similar to the cleft graft that has been described, except that the stock is not split at all. Instead, a sharp saw is used to cut a notch upon one side. Usually the notch is made by one or two strokes of the saw. By sawing straight into the wood the notch will be sufficiently wide if the saw teeth have a wide set. Some prefer to use a chisel for this work, as such an instrument will make a notch with smooth surfaces. However, after one has attained some skill with a saw, good notches may be made with that tool. Fig. 28.

In preparing the scion, this will have to be whittled to a somewhat different shape, but in the main, the same principles will have to be observed as with the other method.

In all forms of cleft graftage, but particularly those which employ the splitting of the old wood, it should be remembered that the growth which heals the wound will take place from the scion and gradually spread through the end of the branch or trunk that has been cut off. The old wood is absolutely incapable of growth, and hence is liable to become infected with disease germs unless kept protected until the new wood can cover it over completely. If there is a break in the wax, the sap which is under strong pressure from the roots, will ooze out and become sour, because it has been attacked by certain germs which set up a fermentation. These same germs, and also others, may find their way beneath the wax and the central part of the tree thus becomes affected, and even though the wound may eventually heal, the tree will decay from the interior. This is very likely to cause a hollow tree, which might break down under the first heavy load of fruit.

FIG. 27. Trees top worked to another variety by J. F. Riddell, Manager of the Darby Fruit Farm at Amoret, Mo. Approximately one-fifth of the tree is left to feed the roots. This is cut away and grafted the following year.

FIG. 28. Near view of top grafted tree shown in Fig. 27. The branches are not split, but simply notched with a sharp saw. The wounds are covered with wax. Only one scion is allowed to grow on each branch. Photo by J. F. Riddell, Manager of the Darby Fruit Farm, Amoret, Mo.

Grafting Wax.—There are more than a dozen recipes or formulas for making grafting wax, but all of them are essentially the same. The formula which has been used for many years by the Horticultural Department of the University of Missouri and found to be satisfactory, is as follows:

Common rosin	7 lbs.
Beeswax	2 lbs.
Beef tallow	1 lb.

If this much is not desired, divide each of the above items by two, three or four, as may be needed. Dissolve all of the ingredients in a vessel over a slow fire, stirring thoroughly. When they are well mixed, pour such of the mass as can be handled at one time into a tub of water, where it will quickly cool. Grease the hands with tallow and gradually work the mass together in the water. When cool enough to stick together, remove from the water and pull like taffy candy until it becomes too stiff to work. The process should be kept up for at least fifteen minutes, or until the mass has changed color, much in the same manner as molasses candy. Roll into balls four or five inches in diameter and store away until needed. It will keep indefinitely. Instead of the beeswax, some people prefer to use paraffin. Also, raw linseed oil is sometimes used instead of the tallow that was recommended.

Budding.—Apples may be propagated readily by budding during late summer. The work is usually done about the last of August or the first week in September. The buds must be inserted in the wood that grew the same season that budding is done. If the trees are grown from the seed they may be too small for budding the first season. In this event they should be cut back to the ground the next spring, and the new sprouts budded towards the close of the season. The branches of old trees are sometimes cut off and the new growth that comes out may be budded at the proper season. Similarly where the trunks of trees are cut off for the same purpose or which have been top grafted, but the scions did not grow, sprouts will arise, which may be budded.

Relatively speaking, apple trees are not budded to any great extent, as it is more convenient to propagate them by means of the root graft. It has been claimed that budded trees are superior to those grown from root grafts, the argument being that there is no wound below ground, and hence the organisms which often attack the roots of apple trees will cause no injury. This is undoubtedly partially true, although it is found that budded trees are attacked by the disease known as "crown gall," as well as those that have been grafted. (Detailed statement of how budding is done will be found under the heading of peaches.)

Dwarf Apples.—Any of the common varieties of apples may be grown as dwarfs, provided they are worked upon the Paradise apple, which is a natural dwarf.

Doucin stock produces what is known as half-dwarf apples. Some varieties of apples are not adapted to being grown as dwarfs to any great extent in this country. In general, the very vigorous growing varieties are not adapted to being dwarfed. The Ben Davis, it is known, will not dwarf successfully.

Paradise and Doucin stock must be imported from France, Holland or Germany, as they are not much propagated in this country. Since there is now a small demand for dwarf apple trees, the larger nurseries have begun to carry them in stock. The very large nursery firms of the country generally are able to supply small orders for Paradise or Doucin stock for grafting purposes. They are more expensive than the common stock, as the usual method of propagation is to mound up the earth around the little trees and permit the numerous branches to take root. Then they are cut away and sold. On this account (being rooted branches), they are not adapted to being used as stock for piece root grafting, but are generally set out and allowed to grow one season and then top worked by one of the methods described.

Dwarf apple trees come into bearing much earlier than others, but do not live nearly so long. Dwarf apples, particularly varieties adapted to dwarfing, attain a height of six or seven feet, and hence a large number may be grown on an acre of ground. Dwarfs are sometimes grown in pots.

APRICOTS.

The apricot is like the apple, in that it will not come true from the seed, and therefore must be propagated by budding or grafting, the former being almost exclusively employed. For the best results, seeds should be stratified in sand and frozen during the winter, as described for apples. Apricot seed, however, being larger and more able to meet adverse conditions than the apple, are sometimes planted in the fall in well prepared ground. Here they freeze and come up without delay in the spring. If stratified for freezing (see apple), they should be planted in early spring before they have begun to sprout. The young seedlings are to be given good culture during the summer, but are not to be dug up in the fall like apple seedlings. If they are to be budded, the work should be done about the first of September, during the first season's growth. If it is desired to graft them, the seedlings should be cleft-grafted near the ground in early spring, at the beginning of the second season's growth, under conditions already described for the apple. If

FIG. 29. Three year old apple orchard top worked by G. H. Sessen near Troy, Mo., in March, 1911. Picture shows about two months growth. On the left before pruning, on the right after all branches below scions are removed. One of the scions will later be taken out.

FIG. 30. Young apple tree top worked by means of the whip graft. The picture on the right shows the growth and pruning received two months after grafting. This is a part of the young orchard near Troy, Mo., top grafted to a new variety by G. H. Sessen of West Plains, Mo., March, 1911.

buds fail to take in the fall, they may be grafted the following spring. One year's growth, after being either budded or grafted, should make sufficiently large plants for setting them in the orchard. For details of budding, see discussion under the peach.

The apricot is often budded upon the peach, as the latter thrives upon a greater variety of soils than the apricot. The common plum makes an excellent stock for the apricot where it is grown in wet situations.

BLACKBERRIES.

Blackberries are propagated in two ways, from sprouts and by root-cuttings. Blackberries sprout readily, and it is a simple matter to dig up the new plants and set them out where needed. By means of root cuttings, the blackberry may be multiplied very rapidly. In late winter, or early spring, before growth has begun, a few long roots may be dug from the old plants. In the cellar these roots may be cut into pieces two or three inches long. They should be at least as thick as a lead pencil, and not more than half an inch in diameter. The pieces may be stored in green sawdust and kept until planting time in April.

The preparation of the soil should consist first, of plowing deeply in the fall previous to planting. In spring harrow both ways until all the clods are broken in small bits. Lay off rows four feet apart with a single shovel plow. In April, at gardening time, the root cuttings may be planted. Sow them in the furrow two or three inches apart and cover two inches deep with loose soil, free from heavy clods.

It is best to allow the plants to grow for two seasons in the nursery row and then transplant them early in the spring to the permanent planting. The one-year old plants are so small that no time is gained by planting them. The rows should be six to eight feet apart, and the plants three feet apart in the rows. Owing to the habit of the blackberry of sprouting quite freely, the plants will soon form a solid mat along the rows and will also fill the spaces between the rows if not kept down by constant cultivation. If neglected for one or two seasons, they will spread over all the ground, and it will be very difficult and expensive to harvest the fruit.

CHERRIES.

The cherry is propagated almost entirely by budding. While seedlings from our common varieties may be used for growing stock, nurserymen always use special kinds of stock which are usually imported from France. The kinds of stock in most general use are the Mazzard and Mahaleb. The Mazzard is the best stock for both sweet and sour cherries

in the east. The Mahaleb is more widely used for the sour kinds, however, for it is easier to bud, and is free from leaf blight in the nursery. The Mazzard, however, appears to form a better root system, stronger union, makes a longer lived tree and is sufficiently hardy. For the plains states, the hardier Mahaleb stock should be used. Both of these may be secured from most any nurseryman in early winter or spring. In a small way, it is quite feasible to grow one's own cherry stock from the seeds of the fruit raised at home.

Cherry seeds should not be permitted to become thoroughly dried out at any time. On this account it is advisable to store the seeds through the remainder of the summer, after ripening, in boxes of sand and bury

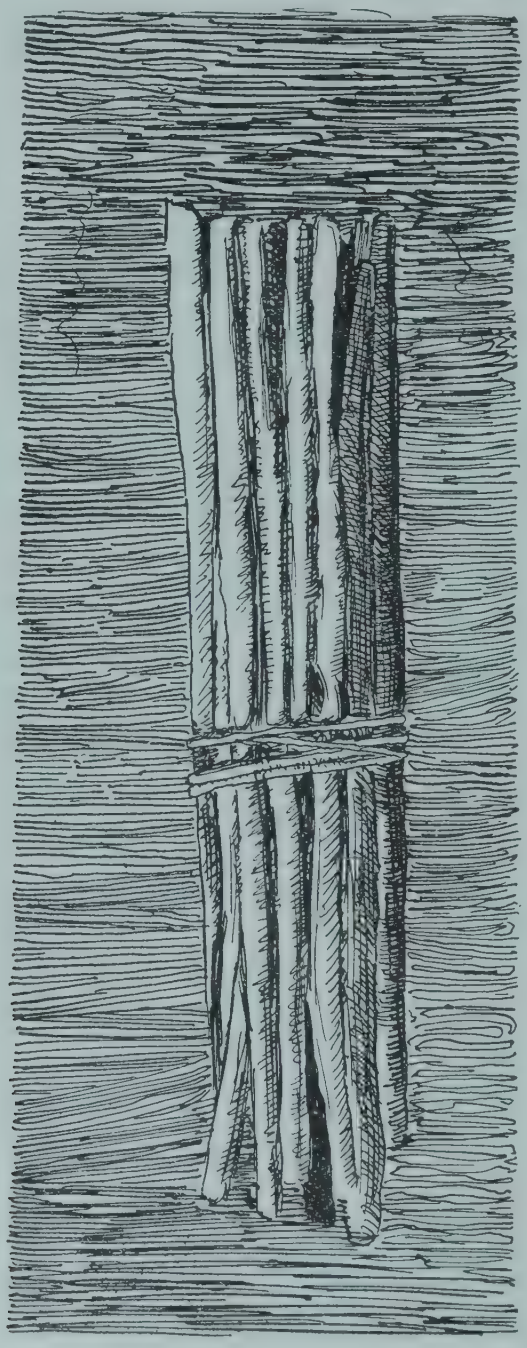


FIG. 31. Currant cuttings in a "callus pit." They are buried upside down in the soil for two or three months in the fall to cause them to root readily when planted.

them from eight to twelve inches deep in the ground in a cool place. This will keep them moist, and at the same time they will be sufficiently cool and away from the free circulation of air that they will not begin to grow.

At the approach of cold weather the seeds should be taken up and the open boxes of sand kept on the surface of the ground in the shade of a building throughout the winter. Very early in the spring the seeds should be planted in nursery rows four feet apart and an inch or two apart in the rows. Cover with an inch or two of fine soil, if the ground is not too wet. If the seeds are about to sprout and the soil is yet too wet to work well, the seeds should be partially covered with the wet earth and then a dressing an inch thick of well-rotted manure spread over the rows.

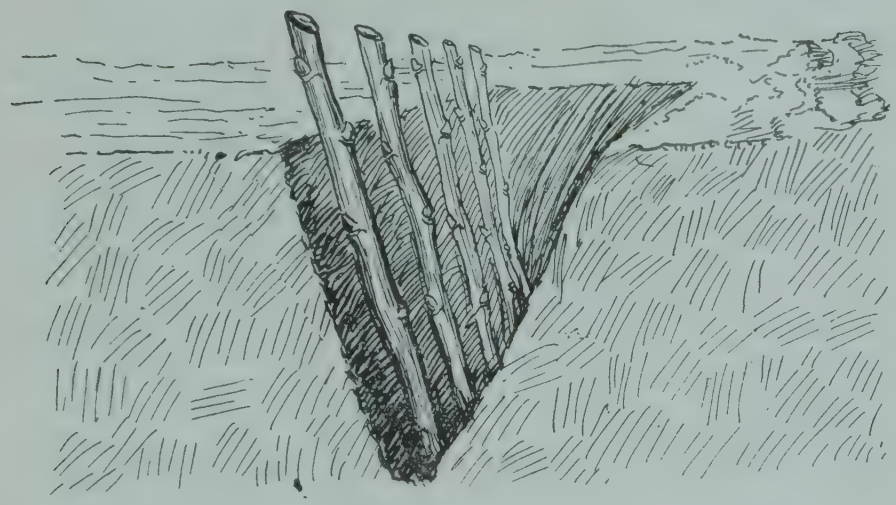


FIG. 32. Method of planting hardwood cuttings in the field. A trench is made with a small turning plow. The cuttings are stood up against the steep side and the earth thrown to them with a plow or hoe. Cover so that only one or two buds are left above ground. From Farmers' Bult. 157, U. S. Dept. Agr.)

The young seedlings should have thorough cultivation during the summer. About the last week in August or the first week in September, or earlier, if the bark peels readily, the budding should be done. In the south where the spring opens much earlier, the seedlings may be large enough for budding in June. In that event, one year's time is saved, as the tops are cut off immediately, and the young trees often grow to transplanting size the same season. Full details for the budding will be given under the discussion of peaches. When the trees have had one year's growth from the buds, they are of the proper age to be transplanted to the orchard. Cherry seedlings are sometimes cleft-grafted in spring, where the buds the previous fall failed to take. (See cleft-grafting under apples.)

CURRANTS.

Propagation of the currant is best affected by means of long hard wood cuttings taken either in fall or spring. In nursery practice they are commonly taken about September first, or as soon as the leaves fall. The leaves are sometimes stripped from the plants a week or so before taking the cuttings, if they have not already fallen. The cuttings may be planted at once in the nursery rows or tied in bundles and buried upside down with two or three inches of soil over the butts. They should be buried in a well-drained place where they will not become water-logged if rains should come during the autumn. Fig. 31 shows bundle of cuttings buried upside down, preparatory to storage or planting. At the approach of cold weather, they may be taken up and planted in nursery

FIG. 33. Mound layerage. This is a good way to propagate currants, gooseberries, quince and Paradise apple. Cause a number of young shoots to spring up around an old plant; wound these near the ground by hacking with a knife or twisting so that the bark is broken, then draw up the earth around them to a depth of six or eight inches. In one or two seasons sprouts or branches so covered will have taken root and may be removed.

rows and covered with a mulch of soil or other material during the winter, this mulch of soil being raked away to expose the tips early in spring.

Upon the other hand, planting may be delayed until spring, the bundles being taken up and stored in sand or packing moss in the cellar, or more deeply covered with soil and allowed to remain where they are buried outside. The commoner practice is to plant the cuttings in nursery rows soon after they are taken. They are said to root more quickly if packed in damp moss a week or two before planting. It is very essential to mulch the fall-planted cuttings with some kind of material; probably nothing surpasses the soil itself for this purpose, especially in the dry climate of the plains. If the cuttings are kept until spring, planting must be done very early, as growth begins when the weather is yet cool. This makes spring planting undesirable in nursery practice.

Cuttings vary in length from six to ten inches, according to soil and climate. The drier the climate and the lighter the soil, the longer the cuttings should be. In planting, only one or two buds are left above the surface, and the soil should be pressed firmly against them all the way down to the base. Rich, moist soil should be selected in which to plant them. See Fig. 32 for method of planting cuttings in a trench made by opening out a furrow with a small turning plow.

Another method of propagating currants is by what is known as mound layerage. This consists of drawing the soil up around the plants until the lower parts of many of the branches are covered, as shown in Fig. 33. Left in this way for one or two seasons, they readily take root, and may be cut away, each branch making a separate plant. When grown from cuttings the plants may be either one or two years old when transplanted to the field. The rows are commonly marked off four to six feet apart, and the plants are set from three to four feet apart in the rows.

FIG. 34. A layered grapevine. Branches of one season's growth may be pulled down and covered at intervals with earth, when they take root in one season.

DEWBERRIES.

Dewberries are propagated very rapidly by a process of runners or natural layers. It is the habit of the plant to sprawl upon the ground, and a large number of the branches that come in contact with the soil readily take root. These may be cut away and make good plants. The dewberry is also readily propagated by means of root cuttings, like the blackberry (which see).

Dewberries may be transplanted either in fall or in spring. They should be set in rows from four to six feet apart, and about three feet apart in the rows.

GOOSEBERRIES.

The common gooseberries are propagated either by cuttings, which are made and handled, as described for currants, or by mound layerage, also described for currants. English gooseberries are largely propagated by the latter method.

When the rooted cuttings or layers are one or two years of age—preferably two—they are ready to be set in the permanent planting. Gooseberry rows should be about six feet apart and the plants four feet apart in the rows. This will permit them to grow large and spreading without crowding each other, and yet leave room for cultivation one way.

GRAPES.

Grapes are propagated almost exclusively by means of cuttings, although a few of the refractory varieties like the Norton's Virginia Seedling, Ozark and Cynthiana, do not root readily, and hence have to be increased by means of layerage. For this purpose the vine is pulled down in spring and covered with soil at intervals of two feet. If the vine be slightly twisted or otherwise bruised at the points where covered, they will readily take root and form strong plants during the season. Late in fall or the following spring, the vine may be cut into sections, each part having roots being a separate plant. Fig. 34 shows a layered grapevine.

Nearly all of the many scores of varieties root readily from cuttings. Grape cuttings should be made in early winter before there has been a hard freeze, from wood of the last season's growth. Vines with the joints close together make better cuttings than those having the joints far apart. Begin at the butt end of the vine, cutting it off squarely just below a joint or node. Counting this joint one, skip two more joints and cut the vine off at least two inches above the third one. It is best to have at least three joints for each cutting, although it is not absolutely necessary

to have but two. The cuttings will range in length from 10 to 14 inches, although the majority are usually about 12 inches long.

FIG. 35. A layered vine. (From Farmers' Bul. 157, U. S. Dept. Agr.)

Pack the cuttings in bundles of fifty each and store in green sawdust in a cool cellar until spring. The ground on which grape cuttings are to be planted should be moderately rich and plowed very deeply, preferably the fall before they are planted. The cuttings should be planted out early in April, care being taken to see that their buds have not begun to push out while packed in the sawdust. In the nursery the rows should be four feet apart and perfectly straight, being lined up with a wire or garden line. The cuttings may be planted by making holes about four inches apart, like planting apple grafts, or a furrow from eight to ten inches deep may be made. In either case, the cuttings should not stand up straight, but should lean toward the south, and the soil be packed very firmly around the bottom joint; only the top bud should be left above ground and the soil should be almost up to it. Fig. 32.

The cuttings will often strike root from both the joints under ground, thus making very strong plants. They should grow in nursery rows for one, or preferably, two years, when they are ready to be moved to the permanent planting. The vineyard rows should be from eight to ten feet apart and the vines from six to eight feet apart in the rows. At the time of planting the vines should be cut back, leaving only about two buds to each branch.

Old grape vines are sometimes renewed or the varieties changed by cleft-grafting. This is done in the manner described for cleft grafting the apple, except that the soil is drawn away from around the plants and the vines sawed off below ground at least three or four inches. The vine is split open and two scions inserted and the earth packed around them. It is not necessary to use grafting wax on the wound. The soil should be drawn around the scions, leaving only one bud of each above ground.

Single Eye Cuttings.—When wood for making cuttings is very valuable or scarce, rapid propagation is affected by means of single eye cuttings, using either the matured wood of the new growth in fall or the green growing wood in summer. The cuttings in either case are made by using only one joint for each, and must be started into growth by being covered an inch deep, while lying flat in a sand box or bed in a greenhouse or hotbed. Single eye cuttings make weak vines.

NECTARINES.

The propagation of the nectarine is in every way like that of the peach. In reality, the nectarine is a form of smooth-skinned peach. Formerly it was thought that the nectarine was a distinct species of plant, but it is now known that nectarines often come from seeds of peaches and peaches have come from the seeds of nectarines. Either may originate from the other by means of bud variation. Because of the smooth skin of the fruit, it is perhaps more liable to the attacks of the curculio. It is less popular in the market than the peach, and therefore is less grown, although in California it is planted on a commercial scale. In that state it does well on almond stock. (See peaches.)

PEACHES.

Peaches, plums, nectarines, apricots and cherries are propagated almost entirely by budding, the work usually being done in summer in the south (June budding), or in the latitude of Missouri and northward, about the first of September. The process of budding for all of the fruits mentioned in this paragraph, including the growing of the stock, is practically the same, so that a description in full for peaches will answer for the whole.

Peach seeds must be frozen in order to secure best results in getting them to sprout. Peach seeds may be planted in the fall in the nursery rows, or stratified in boxes of sand (see Fig. 14), left uncovered in the shade of a building outside during the winter, where they will freeze, and are planted in spring. Nurserymen who raise peach stock on a large

FIG. 36. Peach "budding sticks." In Missouri peaches are budded about Sept. 1st. Select only wood buds for budding. The best buds are usually found in the middle or toward the base of the twigs. Trim off leaves, allowing the stems to remain. Note how buds are sliced off from the lower side. An incision crosswise above the bud and a deft movement with thumb and finger peeling it from the wood, completes the job.

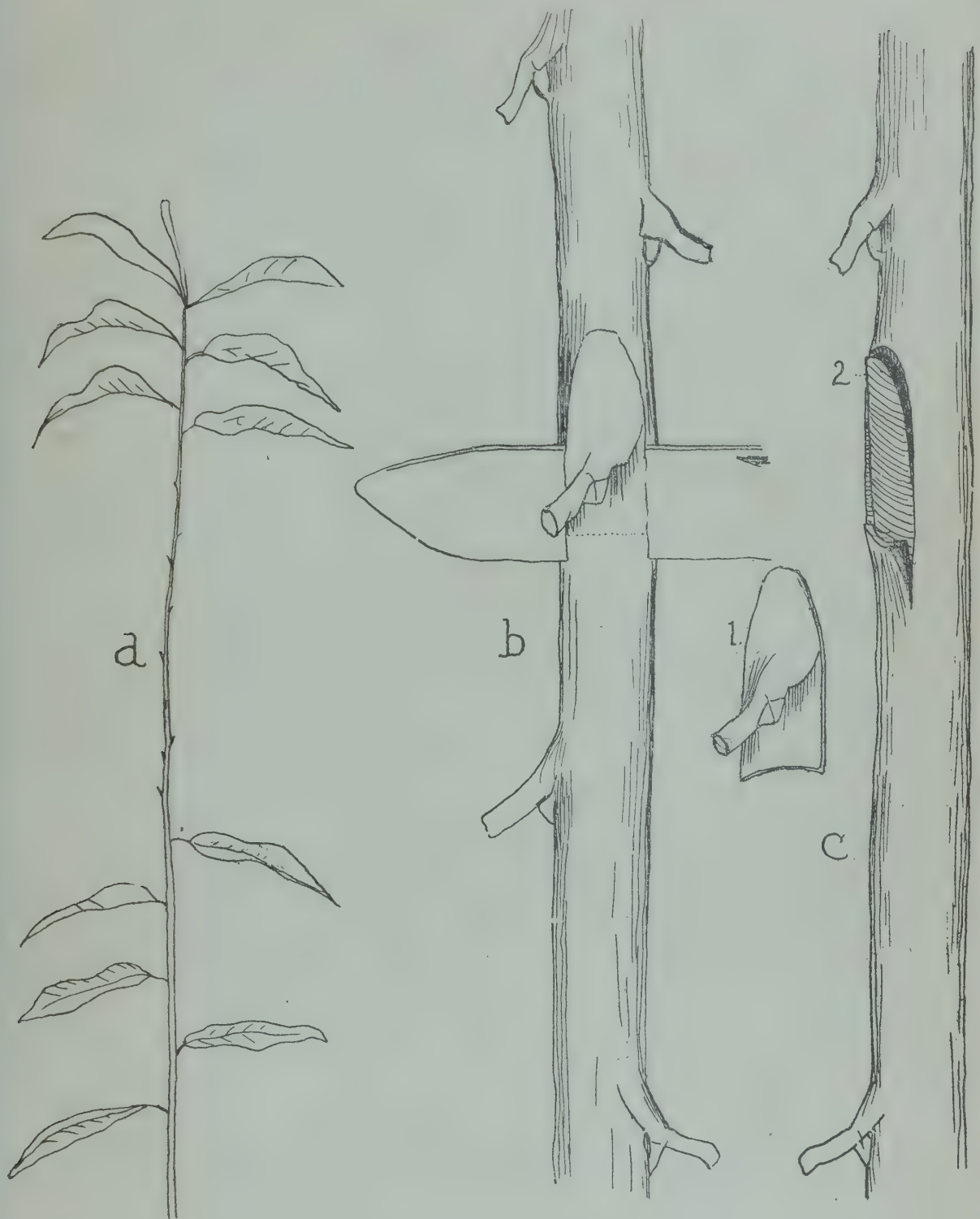


FIG. 37. In this figure *a* represents a peach "budding stick." The best buds are located where leaves are removed. At *b* is shown how to remove a bud from a "stick." Make a cross cut at the dotted line near bottom of knife blade and peel bud from the wood with the thumb and finger. At 1 is shown the shield-shaped piece of bark containing the bud. At 2 is seen how the first cut included a slice of wood, but how this wood was left behind when bark and bud were peeled off.

scale often place the seed on the ground in a heap and cover them with sand, the mass being allowed to freeze during the winter. When peach seeds are gathered about the home for the purpose of growing stock for budding, it is best not to allow them to lie in the sun and dry out during

the late summer and fall. If they are placed in boxes of moist sand while they are still fresh, they often germinate more evenly when planted the following spring. Planting the seeds in fall is not as satisfactory as stratifying them in sand for freezing, and in spring planting them in freshly prepared soil.

Stratify for freezing, as described for apple seeds. For spring planting of peach seeds, the soil should be plowed the previous fall in order that it may be worked early in spring. Prepare as for a garden spot, and lay off rows four feet apart with a single shovel plow; scatter the seeds in the furrow from one to two inches apart and cover with about two inches of loamy soil. They may have to be planted when the soil is too wet to cover them properly. In this event the furrows should be given a dressing an inch thick of well-rotted manure. It is best not to plant these seeds on a soil that is too rich, as the young trees will make too rank a growth, both before and after being budded. The seedlings should be given good cultivation by plowing or hoeing during the summer.

In the latitude of Arkansas and Tennessee and farther south, where the peach seeds may be sown in February, the seedlings by June are large enough to bud. When budded in June, the tops are cut away as soon as the buds unite and the growth is very rapid, so that the trees by late autumn are large enough for planting in the orchard. While June budded trees are usually smaller than those budded in the autumn, one year's time has been saved, which is often a matter of great importance to the grower of the trees, whether he be growing them for his own use or to sell.

For autumn budding, which is the most common practice, the buds should be inserted about the last week in August or the first week in September. In general, the budding should be done when the bark peels best. When the work is ready to be done the buds are to be selected from the desired varieties. Buds are always procured from young branches that have grown the same season budding is done. On these young branches, there will always be a few inches toward the tip which is soft and immature, and therefore this part should be cut away. Peach tree twigs contain both flower buds and leaf buds. If flower buds only are present and were used for budding, they would do nothing but flower and die, while the leaf buds (also called wood buds) will grow and make a top to the tree. The best wood buds are found toward the middle of the twig, as shown in Fig. 37*a*, where leaves have been removed.

The wood buds may be distinguished from the flower buds (also called fruit buds) by remembering that they are smaller, flatter and never

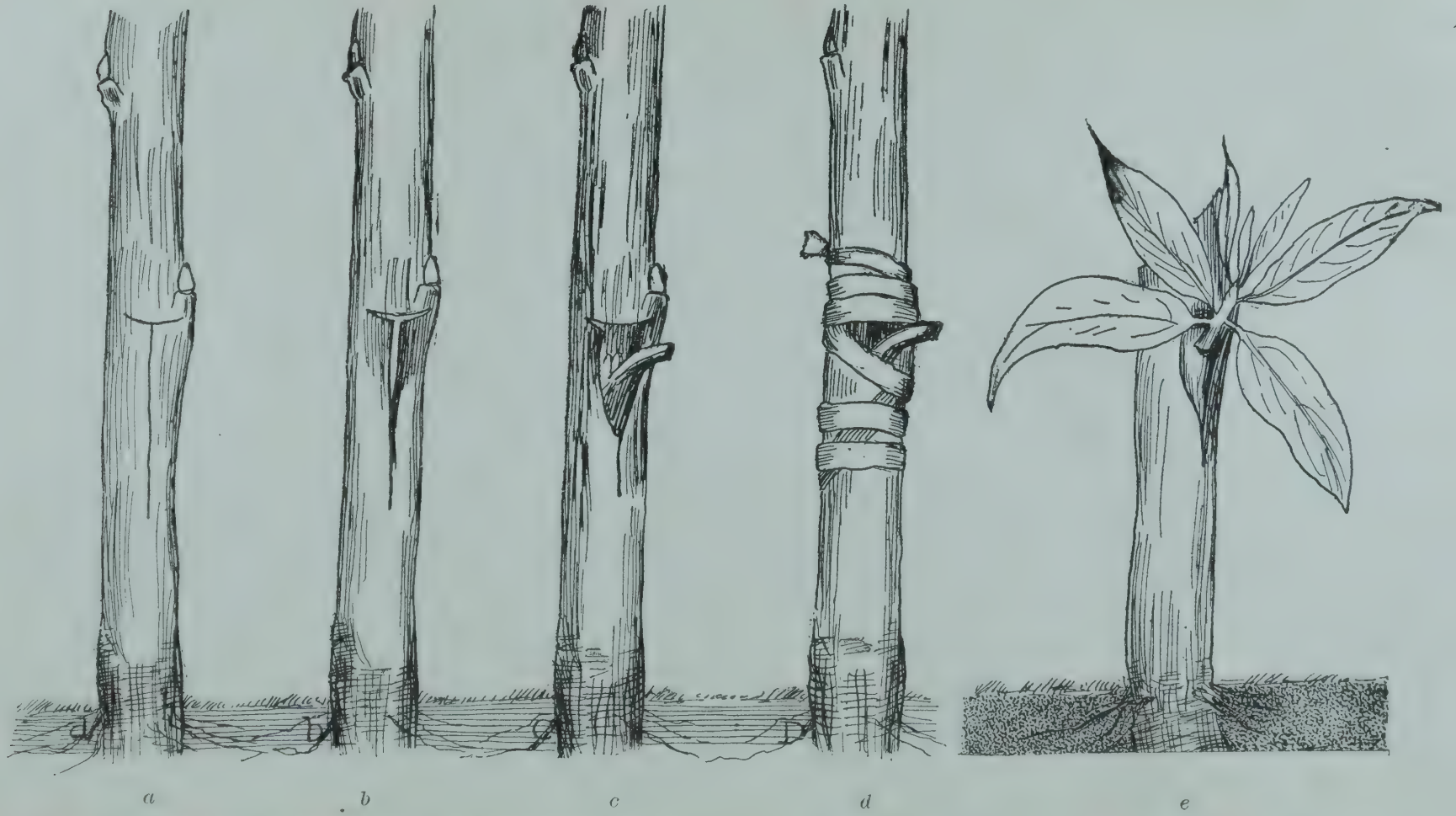


FIG. 38. *a, b, c, d* and *e* show the successive stages of making the incisions and inserting the bud in seedling peach trees. Do this about Sept. 1st. Cut off seedling trees just above buds after the latter have begun to grow the following spring.

so plump. A fruit bud can do no particular harm if there is also a wood bud. It is desirable to know this, as a wood bud will often have a fruit bud on either side of it. When this occurs the outside buds may be broken off, as they are of no use. Where there is only one bud at the base of the leaf, it is usually a wood bud, and where there are two or three in a row across the twig, it is almost certain that the middle one is a wood bud and the outside ones flower buds. After a little observation and practice, it will not be difficult to select the proper kind of buds to use.

FIG. 39. How a blackcap or a purple-caned raspberry is propagated by means of the rooted tips of the branches. (From Farmers' Bul. 157, U. S. Dept Agr.

The weather is usually very warm at budding time, so that it will be necessary to wrap the twigs from which the buds are to be taken in a damp cloth or an old newspaper moistened on the inside to prevent their drying out. As soon as the twig is cut from the tree, trim off the leaves, leaving a piece of stem about half an inch long to hold to when the buds are being inserted. Fig. 36. The manner of cutting the buds from the twig, which is known as a budding stick, is shown in Fig. 37, *b*. Hold the budding stick in the left hand, upside down, and with the other hand force the knife blade down through the bark and into the wood, making a downward cut. Next withdraw the knife and at a point down nearly to where the cut stopped, make a cross cut just through the bark, and no deeper. If the bark peels easily (and it should at budding time), the bud may now be lifted up and the bark will part from the wood very readily. While many prefer to have no wood adhering to the bud, there are some who slice the buds off from the twigs, leaving a portion of the wood attached to them. It is best to peel the bark containing the bud from the budding stick, leaving all the wood behind. See Figs 36 and 37.

Budding.—The little seedling peach should be budded as near the ground as it is convenient to work, which will be two or three inches from the surface of the soil. The first step in preparing the seedling to

FIG. 40. Photographs of blackcap raspberry "root tips." Note number of branches in the upper figure and in the lower figure how a single branch may subdivide. To induce rooting, the soil about the plants must be kept fine and loose.

receive the bud is to make a slit in the bark lengthwise, and at the upper end of this slit a crosscut, thus forming a T-shaped figure on the bark of the sprout, illustrated in Fig. 38, *a*. The bark should peel readily, and in Fig. 38, *b*, may be seen how it has been gently raised with the point of the knife and the flaps slightly rolled back. At this point the bud should be cut from the budding stick as directed, and inserted beneath the bark of the sprout by holding with thumb and finger the short stem left for the purpose, and gently forcing it downward, sharp end first, until the square end of the bud gets down to where it will fit against the crosscut in the bark itself. In Fig. 38, *c*, the bud is seen in position and ready for wrapping.

In order that the bud may form a union with the growing seedling, it is necessary to press it closely against the tree by binding with some sort of a string. Nurserymen commonly use a kind of grass known as raffia, which is wet before applying and adjusts itself to the parts to be covered, and makes an excellent wrapper. A good substitute for raffia, easily obtainable by everyone, is strips a quarter or half an inch wide torn from an old handkerchief or similar old and thin linen or cotton goods. They are sometimes tied with strips of wet corn shucks. Whatever is used is to be bound around the newly inserted bud, as indicated in Fig. 38, *d*, in such a manner as to leave only the stem of the leaf on the bud sticking out. This leaf stem will serve as an indicator to show whether the bud has united or not. If the stem remains green, the bud is living, otherwise it will turn brown in a day or two.

FIG. 41. Strawberry plants are propagated from the runners which creep along the ground and take root at the nodes (joints). (From Farmers' Bul. 157, U. S. Dept. Agr.)

Do not wait longer than a week or ten days before examining the buds to see if they are living. If they have united with the trees, release the bandage by cutting it on the opposite side from the bud in order not to disturb the healing wound. This early examination and cutting of the

string must not be forgotten, as it is very important. At this time the little trees are making a very rapid growth in thickness, and in a remarkably short time will grow over the string and literally choke the trees to death, or what is more to the point, will make a deep ring in the tree and cause it to break off where the bud is inserted. During the autumn in which the bud is inserted in the tree it will make no growth other than to make a firm union with the stock, the bud itself remaining dormant.

The following spring the bud will begin to grow along with the other buds on the tree, and now the little tree must be cut off about a quarter to half an inch above the bud, as shown in Fig. 38, *c*. This will throw all of the growth into the new bud and it will shoot upward rapidly. A large number of little sprouts will be certain to spring up around the stump, and it will be necessary to rub them off two or three times during the early summer in order to keep the growth where it is wanted.

It is best to plant the peach seeds in rows running north and south, which will make it possible to bud all the trees on the north side. This is thought to be desirable, because it is believed that the sun may injure the buds when they are first inserted. One season's growth from the bud makes trees of the proper age for planting in the orchard. In Missouri, peach trees are commonly set in rows from 16 to 20 feet each way.

In a new region where it is desired to grow peaches it is often the case that varieties known to be successful elsewhere, are planted extensively, but on reaching bearing age are found to be unsuited to the soil, climate or other surroundings. In this event, all of the branches

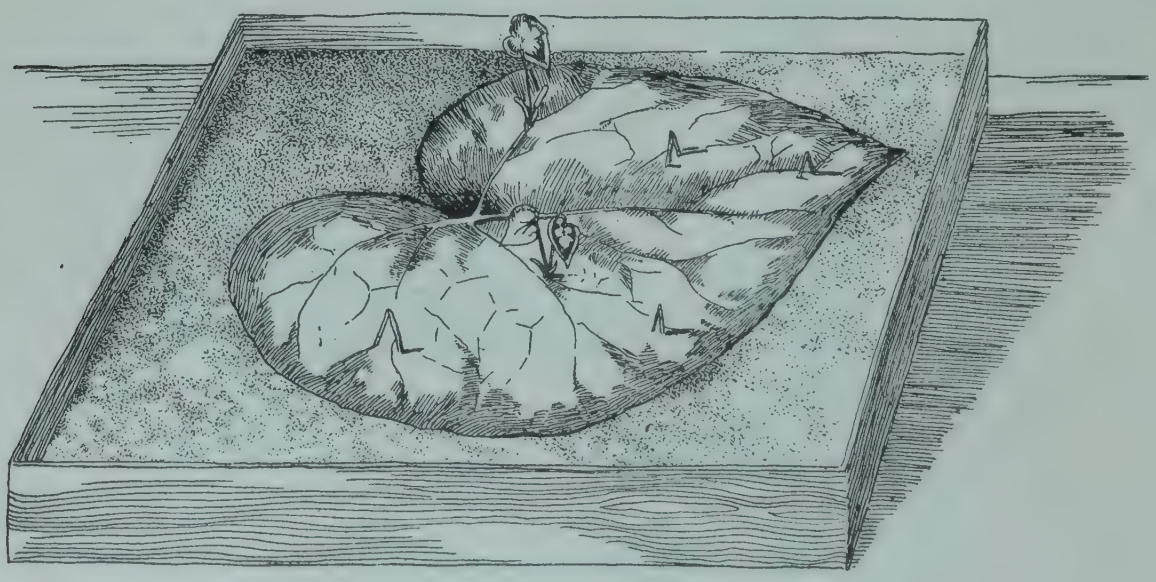


FIG. 42. Leaf cuttings. Rex begonia leaf flat upon the sand with stem buried beneath. Wound the "nerves" or ribs of the leaf by breaking. Pin to the sand with splinters of wood or weight down in close contact with the moist sand with pebbles. Young plants will spring up along the main ribs and at the point where the stem joins with the leaf. (From Farmers' Bul. 157, U. S. Dept. Agr.)

should be cut back to stubs from two to four inches long. These will throw out sprouts which may be budded the following season with the desired variety. Undesirable varieties are sometimes planted by mistake among other trees, and these may be top-worked or renewed with the desired sorts in the manner described.

PEARS.

Pears are propagated by both budding and grafting, like the apple. The essential differences between grafting pears and apples are: That the pear is always grafted on whole seedling roots, the scion being four to six inches long and the union being made at the crown. Also, after the graft is made, the wound must be entirely covered over with grafting wax. As soon as the hot wax is spread on, the graft should be dropped into a tub of water in order to cool it immediately. See Fig. 20, *c*.

Seedling pear stock is not extensively grown in this country, owing to the difficulty of securing the seed. Nurserymen import their stock

FIG. 43. A rooted leaf cutting of Rex begonia. The stem is buried in moist sand and takes root as shown in the picture. (From Farmers' Bul. 157, U. S. Dept. Agr.)

from France, and persons desiring to do their own propagating may purchase seedlings from the nurserymen at reasonable prices. If pear seeds are procurable, it is easy to grow the stock by stratifying them in sand and allowing them to freeze, and otherwise treating them like apple seed. The management of the seedlings and scions and time of doing the grafting, is the same as for the apple. For time, manner and precautions in planting the grafts, the reader is referred to the discussion under apples.

Pear trees may be both budded and top-worked in precisely the same way as that described for apples.

Dwarf Pears.—If pear trees are grown upon pear roots, either by budding or grafting, they are known as standards. When worked on the quince root, the pear is easily grown as a dwarf. It then comes into bearing earlier, and since the trees are small, the fruit can be easily thinned and sprayed and therefore should be of a high quality. Dwarfs require more care than the ordinary standards however, and they should not be planted unless the owner understands this fact and is willing to give the attention that they need. Although the trees are by nature dwarfed, since they are worked on a smaller growing species, they nevertheless tend to become half standard if left to themselves. A dwarf pear tree should never reach a greater height than twelve feet. In order to keep it down to this stature, it is often necessary to remove from one-half to two-thirds of the annual growth late each winter.

A good dwarf pear tree is one in which the union with the quince stock is very close to the ground. When the tree is planted this union should be from four to six inches below the surface, after the ground has settled. It is the common belief that dwarf pears do not live as long as the standards, but this is not necessarily true. The variety that is oftenest grown as a dwarf is the Duchess. Other varieties propagated as dwarfs are Louise Bonne, Anjou, Clairgeau, Manning Elizabeth, and to a less extent, Bartlett, Seckel and Kieffer. Both standard and dwarf pears are ready to be planted in the orchard after growing in the nursery for one or two seasons, the two-year olds being preferred.

PLUMS.

Plums are propagated by budding, a full description of the process being found under the peach. While the seeds of any of our common plums will make desirable stock upon which to bud, nurserymen generally use either Myrobolan or Marianna stock. The former is used extensively in the north, but is inclined to sprout badly. The Marianna is much

recommended in the south. Plum stock is extensively imported from France, owing to the difficulty of getting seeds in sufficient quantities for planting in this country. When plum seeds are planted, they are to be treated in every respect like peach seeds.

FIG. 44. Geranium cuttings. Such cuttings need not be more than three or four inches long, and they are often much shorter. Allow about two leaves to remain on the cuttings, removing all the others. If those left are larger than an inch or two across, trim them down. Too much leaf surface will cause an undue amount of evaporation of moisture from the cuttings and this may cause them to wilt before they take root. Cuttings should root in ten to fourteen days. (From Mo. Expt. Sta. Circ. 13.)

Plum stock may be quickly and easily grown from hard wood cuttings of the Marianna plum. This variety, while often planted, is usually worthless, so far as its fruit is concerned. The trees are always large and exceedingly vigorous, but they refuse to bear fruit. In early winter the twigs of the last season's growth may be taken and cut into sections about six or seven inches long and stored away in green sawdust, like apple scions. The cuttings are planted in spring in a well-drained soil. A furrow with one straight side may be opened up with a small turning plow and the cuttings planted therein by standing them up, leaning slightly toward the south against the perpendicular wall of the furrow and have the earth packed tightly around them, especially near their base. The cuttings should be planted with only one or two buds left above ground. They will take root and make a growth large enough to bud the same season. See Fig. 32.

Plums are often budded upon peach stock in order that they may be

grown upon locations where the plum roots would not thrive. Plum roots also make good stock upon which to bud peaches when the latter are to be grown in wet situations. Plums are usually grown in the nursery for one year after budding before being planted in the orchard. They may, however, be allowed to grow two years before transplanting. In the orchard they are commonly set from 15 to 20 feet apart each way. For detailed directions for budding, see under peaches.

QUINCES.

Quinces are propagated in four ways: By cuttings of the ripened wood, and also from pieces of roots treated like cuttings; mound layers; root grafting, and budding. Hard wood cuttings are employed by nurserymen who have light warm soils. They are handled like grape cuttings and made like currant cuttings. In mound layering the old plant is cut back to encourage a growth of sprouts from the crown. A mound of soil is then thrown up about them, as described for currants, and when rooted, the sprouts are cut off. Plants so grown are not the most desirable, because of their tendency to sprout when set in the orchard. When root grafting is employed, pieces of apple roots are spliced to the scions. These roots assist the cuttings in becoming established and often are removed when the nursery tree is transplanted to the orchard.

If budding is employed, the quince seedlings should be grown in the manner described for apples, the time and manner of budding being the same as for that fruit.

FIG. 45. Soft or greenwood cuttings—chrysanthemum, sweet alyssum and coleus, respectively. Plant in moist sand, firming well after setting. Note that parts of the large leaves are trimmed off to prevent too much evaporation of moisture from the plants. (From Mo. Expt. Sta. Circ. 13.)

RASPBERRIES.

There are three kinds of raspberries, the reds, the blackcaps and a cross (hybrid) between the two. Red raspberries are readily propagated by means of the sprouts springing up abundantly from the roots. They may also be propagated by means of root cuttings in the manner described for blackberries. Plants of one season's growth are ready to be set in the permanent planting. The rows should be at least four feet apart and the plants three feet apart in the rows. They quickly spread and cover all the ground between the plants, and also between the rows if this space is not kept clear by regular summer cultivation.

FIG. 46. A rose and begonia cutting. The leaves have been pruned somewhat to reduce their size and evaporating surface. Rose cuttings are generally made indoors in February or March from growing plants. They will require about three weeks to strike root. (From Mo. Expt. Sta. Circ. 13.)

Blackcap raspberries are propagated entirely by what is known as "root tips," illustrated in Fig. 39. The old plants produce long, drooping branches, which bend over and touch the ground and take root at the tips. To take root readily the soil must be cultivated during the summer or else a shovelful of earth must be thrown over the tips of the branches in midsummer. To rapidly increase the plants by this method, it is only necessary to pinch out the terminal bud when it begins to show a tendency to take root, which will cause from three to five branches to spring out at or near the end, each of which will soon touch the ground and take root. Of course, these plants will not be as strong as a single one would be without the pinching. Refer to Figs. 39 and 40.

The third form of raspberry is often classed with the red raspberries, although it is the result of a cross between the reds and the blackcaps. The fruit is very much like the reds, but in its manner of propagation it is like the blackcaps. The Shaffer (or Shaffer's Colossal) is the best representative of this type. All of the plants coming from root tips are formed in the summer and have two or three months in which to grow. The following spring the rooted branches may be cut off about six inches from the ground, thus leaving a handle by which to pick up the plants.

The root tips of both the blackcaps and the hybrid form, are planted in spring in well prepared soil, the rows being four feet apart and the plants set three feet apart in the rows. These plants never sprout from the roots, hence the spaces in the rows between the plants are in no danger of being taken by sprouts.

STRAWBERRIES.

If the soil about the old plants is kept in a pulverized condition during mid and late summer by cultivation, strawberries are propagated readily and rapidly by means of runners. Each year in July, after the fruiting season is well over with, the plants begin to throw out runners, which creep over the ground in all directions. These runners take root at the nodes (joints) very readily if they can touch moist soil. After taking root, a runner will continue to increase in length, and may take root at several places, but the plants will gradually grow smaller toward the tip. In order to have strong plants, it is not advisable to take them from runners that have rooted at more than three places. See Fig. 41.

It is a custom among growers who raise large quantities of strawberries for shipment to grow their own plants for setting their plantations. They have found that it pays to set apart a special plot of ground for raising the plants to set. The plants used to propagate from are never permitted to bear any fruit, all of the flowers being carefully picked off as soon as they form. Under this treatment the plants throw out very strong runners. These are often pruned back in order to prevent their forming too many plants. The pruning is done with a sharp spade, which is jabbed into the ground among the runners, or they are chopped off with a sharp hoe. However, all do not take these precautions. It is considered of more importance to prevent the plants from fruiting than it is to prune the runners.

For a home berry patch, the young plants may be taken up in September of the season they were formed, and set in the permanent planting, where they will make considerable growth before cold weather. These will bear some fruit the following season. For a commercial

FIG. 47. Cuttings of hydrangea, heliotrope and double petunia. All of these are easily rooted in sand. Pot off when roots are an inch long. (From Mo. Expt. Sta. Circ. 13.)

planting, where the fruit is to be sold in large quantities on the open market, it is the unanimous verdict that the plants should not be set out in the field until early spring, and then not permitted to fruit any that season, the flowers all being picked off. Strawberries may be transplanted almost any time during the year when the ground is not frozen, but if set in the dry, hot weather of mid or late summer, it is very troublesome to keep them alive. If one is prepared to irrigate or otherwise prepared to water the plants regularly, they may be set at any time in summer or fall. This, however, applies only to small home plantings.

The strawberry being a cool weather plant, that is, growing when the temperature is quite low, it is important in spring planting to get them out as soon after the frost is out of the soil as possible. Strawberry rows should be four feet apart and the plants in the rows set from 15 to 30 inches apart—two feet being about the average distance.

PROPAGATION OF ORNAMENTALS, ETC.

Ornamental shrubbery and bedding plants are extensively propagated, both for market purposes and for home use. Since there are hundreds of different kinds of plants that are multiplied in the same manner—particularly by means of cuttings, no attempt will be made to mention each one separately, but instead, they will be discussed by classes according to their best methods of propagation.

Herbaceous or Softwood Cuttings.—A cutting is a piece of a plant which has been cut off to plant in the soil, sand or water, in order to make it form roots and grow. Cuttings may be made from stems, leaves and roots. In making cuttings, both hard or mature wood and soft or growing wood are employed. Hardwood cuttings are taken from dormant wood that is not more than one year old, while green wood cuttings are made from the stems or branches of certain plants while they are in a green or growing condition.

The following are a few of the more common plants that are multiplied by means of green or softwood cuttings: Geranium, coleus, wandering Jew, roses, carnations, cigar plant, chrysanthemum, alternanthera, sweet alyssum, double petunia, begonia and fuchsia.

FIG. 48. Cuttings of fuchsia, alternanthera, marguerite and cigar plant. None of these are more than two or three inches in length. Plant in moist sand, and they will be rooted and ready to transplant to two-inch flower pots in about two weeks. (From Mo. Expt. Sta. Circ. 13.)

Such hardwood plants as privet (so largely used as a low hedge) and hydrangea, are also largely propagated by taking the soft, green growing tips in early summer and rooting them in well shaded sand beds.

Propagation from softwood cuttings is carried on in the winter time under glass or in the home, by using boxes of sand in a window.

Leaf Cuttings.—These are commonly employed in propagating begonias, hoyas, Bryophyllum, gloxinias and a few other plants having thick, fleshy leaves containing a large quantity of plant food either in the body of the leaf or its larger ribs. Cuttings may be made from a whole leaf or parts of a leaf. In either case, a leaf which has reached its full development and is in a vigorous, healthy condition, is essential.

If planted whole, the stem is buried in the sand up to and including a small part of the leaf blade. They are also laid flat upon the sand, right side upward and pinned down, as shown in Fig. 42. In this case the stem is buried and the principal "veins" or ribs are often wounded by being broken. This facilitates sprouting at these points. If material

is scarce the begonia leaf may be cut into several triangular-shaped pieces, each one bearing a small portion of the stem (petiole). Bury the basal end in the sand an inch or so. In Fig. 43 is shown a rooted cutting consisting of half a leaf.

Stem Cuttings.—Softwood stem cuttings will consist of a piece of a stem or branch containing two or more nodes or "joints." See Figs. 44 to 49. Stem cuttings of nearly all the common bedding plants root readily, usually within ten days, if conditions are favorable.

FIG. 49. Cuttings of crab-cactus, carnation and wandering Jew. The form of cactus known as the night-blooming cereus can also be propagated from cuttings. Cactus cuttings require much less water than other cuttings while rooting, and the same is true after they are potted off. (From Mo. Expt. Sta. Circ. 13.)

Methods and Conditions.—The sand bed in which herbaceous cuttings are grown indoors should be at least three inches deep and the bottom of the bed should be of such a nature that all surplus water can drain off readily. Clean, coarse sand is the best. Cuttings of average size will be planted about one inch deep. Press the sand down well after planting.

It will be necessary to shade the newly planted cuttings for a few days against direct sunlight. Old papers spread over the bed are good for this purpose. Water thoroughly immediately after planting and afterwards at intervals of a day or two. In cloudy weather less water will be used than when the sun shines brightly. A pane of glass over a small cutting box in the house will be sufficient to confine the air and con-

serve the moisture at times and will also serve to imprison the sun's heat and thus warm up both soil and plants.

Leaf cuttings are handled in the same manner as stem cuttings in all respects. When cuttings have formed roots about an inch long, they are ready to be transplanted to two-inch flower pots. Pot in very fine soil containing plenty of sand and thoroughly decayed compost. Water thoroughly after potting, and keep in the shade for a day or two.

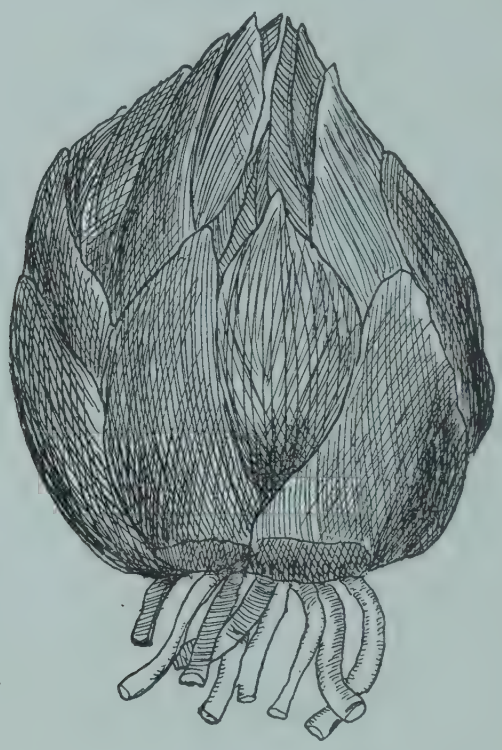


FIG. 50. A bulb. Bulbs that are well known to all are hyacinth, tulip, onion, lilies, etc. Bulbs are propagated by wounding the basal part and causing young bulbs to form. Nearly all of our hyacinths, tulips and other flowering bulbs are imported from Holland. The U. S. Government has succeeded in propagating bulbs in this country, and it is expected soon to have them in commercial quantities. These experiments are being conducted on the coast of Puget Sound in the State of Washington. (From Farmers' Bul. 157, U. S. Dept. Agr.)

Hardwood Cuttings.—Cuttings from ripened wood of many plants are extensively used. Such plants as grapes, currants, gooseberries, Marianna plums, privet, deutzia, spirea, hydrangea, mulberry, willow, poplars, arbor vitae, spruce, etc., are largely propagated from hardwood cuttings. Cuttings should be made from wood of the last season's growth, and are usually from six to eight inches long. Plants with long internodes will be longer, from ten to fourteen inches in length. Collect cuttings in the fall or early winter before severe weather commences, and pack away in green sawdust in a cool cellar.

Hardwood cuttings are planted in spring in well prepared soil. Set so that only one or two buds are left above ground. See Fig. 32. Pack the soil around them thoroughly from top to bottom.

Bulbs and Corms.—A bulb (Fig. 50) is a short rudimentary axis inclosed in more or less close fitting fleshy leaves or bulb scales in which is stored up food to be used in later growth. In fact, a bulb is a more or less permanent and compact leaf bud throwing out roots from its lower portion. Bulbs usually form at or just beneath the surface of the ground. They may be divided into two general classes (1) those composed of scales which are more or less narrow and loose, as in the lily, and (2) those composed of more or less continuous and close-fitting layers or plates, as in the hyacinth or onion. Bulbs often divide naturally into two or more parts or may be divided in this way artificially, and each of these parts serves the purpose of a complete bulb in propagation. If

FIG. 51. A corm. This is sometimes known as a solid bulb. Each year a new corm is formed over the old one. In the picture the old, shriveled corm is easily seen. Buds or sprouts often spring up from almost any part of the surface of corms. These little corms may be removed and grown until large. Nearly all of our corms of flowering plants are imported from Europe. (From Farmers' Bul. 157, U. S. Dept. Agr.)

bulbs are wounded, small bulbs arise from almost any part of their surface. Little bulbs also may grow entirely above ground in the axils of the leaves, in which case they are modified axilliary buds. This often happens on *Lilium Harrisi.* The principal bulbous plants are hyacinths, tulips, lilies and onions.

Corms.—A corm is very similar to a bulb, except that it is solid throughout, and is never made up of scales or layers. Common examples of corms are crocus, gladiolus, Indian turnip and caladium. See Fig. 51.

Rootstocks.—Many species of plants, including Johnson grass and Bermuda grass, Golden seal, etc., spread by means of fleshy rootstocks or rhizomes, which push out laterally in all directions from the parent plant, developing rootlets and throwing up stems of new plants at intervals. The stems which arise from the main rootstock die down each season. They leave a prominent scar at the point where they were attached. The beginning of growth at the outer end of the rootstock, or rhizome, is indicated by a distinct ring. These annual rings show the age of the plant. Compare Fig. 52.

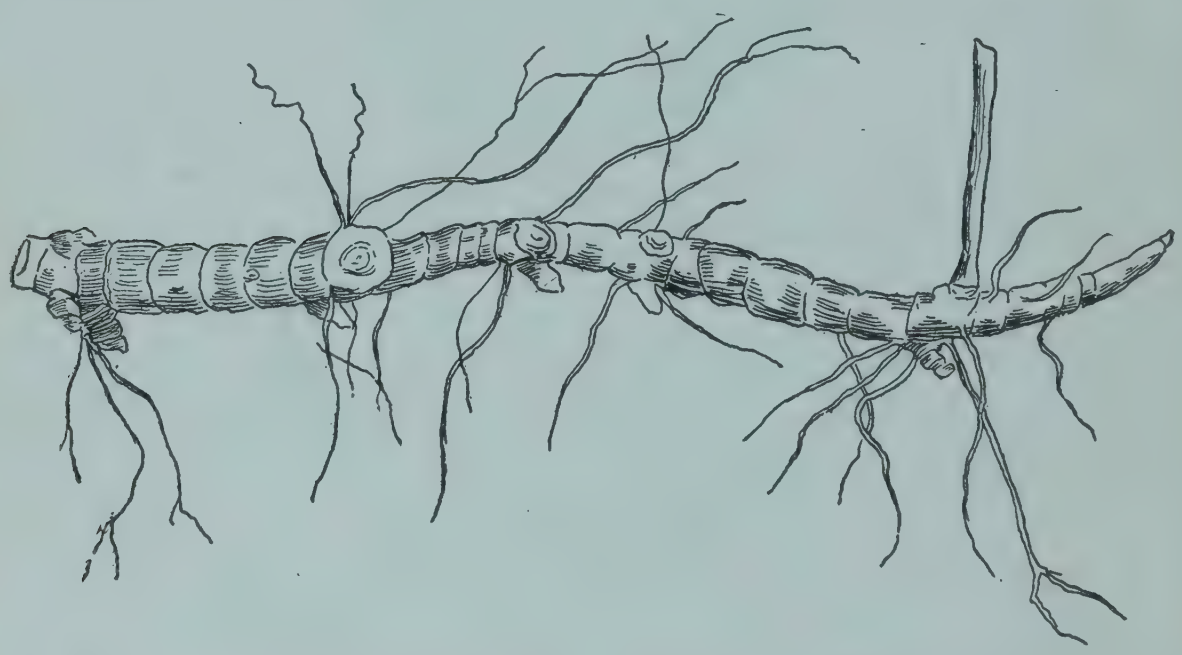


FIG. 52. A rhizome or rootstock. Note the scars which mark each year's growth. (From Farmers' Bul. 157, U. S. Dept. Agr.)

Runners (sometimes called stolons).—Some plants throw out trailing branches, or runners, which creep along the surface of the ground and take root at intervals, usually at the nodes (joints). Strawberry plants and the common wild Indian currant (*Symphoricarpos vulgaris*) are good examples. Other plants throw out shoots, which either trail along the ground or droop over and touch the earth, but in both instances they strike root at the tips. Examples are the common blackcap raspberries and dewberry. Figures 39, 40 and 41.

ASPARAGUS AND RHUBARB CULTURE.

(By Dr. J. C. Whitten, Professor of Horticulture, University of Missouri.)

Asparagus is one of our finest garden vegetables, and merits much more extended culture. It may be grown by simple and inexpensive methods, and should take a prominent position in the home garden as well as in the market garden. Its extreme earliness, appearing in this latitude in early April when spring vegetables are most welcome, is alone sufficient to recommend it for every garden. As ordinarily grown on the farm, it is too troublesome and expensive of culture, and too poor in quality to deserve much appreciation. It is often planted irregularly in beds, so that cultivation with a horse becomes impossible and expensive hand weeding is necessary. Worse, yet, it grows in many gardens in sod and the sprouts are so small and tough as to be almost worthless.

Varieties.—Among the best varieties are Conover's Colossal, Palmetto and Mammoth. The Conover's Colossal produces very large stems, is one of the earliest varieties to start in spring and has a pronounced rank flavor. The Palmetto and Mammoth are sweeter, and of less pronounced flavor.

The Soil.—The soil should be a deep, rich, loose, friable loam. A liberal mixture of sand is desirable. The plant will not succeed except where the soil is well drained. Asparagus will do at least fairly well in almost any good farm soil, particularly if it is given abundant fertilizer. The lighter and drier the soil, the earlier the sprouts may be obtained in the spring. An earlier product may also be secured on a sunny slope. It will produce later in the season and may be good for a longer period on a north or east slope.

Preparation of the Ground.—The ground should be plowed and pulverized very deep. Autumn plowing is preferable. Abundant stable manure should be plowed in if possible. If the subsoil is not naturally mellow and the depth of the top soil will permit it, subsoiling is also desirable. The best subsoiling consists of running a subsoiler or single shovel in the furrow behind the plow. The subsoiler is designed simply to stir the soil in the bottom of the furrow without turning it to the surface. The ground should be thoroughly pulverized until it is mellow and fine on top.

Selecting the Plants.—Plants selected for setting should not be more than one year old. If well grown at this age, they will be as large as it is desirable to move. These plants are ordinarily grown from seeds. The seed should be sown in early spring, three inches apart in rows three feet apart, so as to admit of easy cultivation. These plants should be

cultivated and hoed often throughout the summer and are ready for transplanting to their permanent position the following autumn or spring. These are termed "nursery grown plants."

One may secure still better results by planting the seeds in a hot bed in February, transplanting once during March, and finally moving them to their permanent position in the field in April.

Much better plants may be secured for the permanent plantation if one selects only those which are tender. This selection should be made when the plants are four or five inches high, whether they are sown in the hotbed or in the open field. It should be borne in mind that the seedling plants of asparagus vary greatly, some being tender and succulent and others being tough and stringy.

Almost every gradation of tenderness between these two extremes will be found in a batch of seedlings. How may we determine the difference between them in order to select the best? Plants which are going to produce tender asparagus show even from the beginning as tiny seedlings certain individual characteristics which indicate their good quality. On the other hand, there are certain individual characteristics by which we may select the tougher plants. Ordinarily, those plants which are going to produce tender asparagus, lengthen rapidly as they come up; produce a straight succulent needle-like stem and do not branch near the ground. Those which are to produce the tough asparagus, and which therefore should be discarded, are the ones which lengthen more slowly and which tend to branch nearer the ground. Furthermore, tender plants usually are straight grained, smooth and blunt at the tips. Tough plants are often twisted, gnarled in appearance, show furrows and extended woody fibers on their sides, have angular extensions at the sides where later branches are to be produced, and have a looser or more open growing tip, which indicates the opening of branches or a tendency to branch quickly. Even while the plants are only a few inches high, it is as easy then to tell the difference between the tender and the tough ones as it is to distinguish the difference betwen a straight graind tree which will split smoothly from end to end, and a cross grained, gnarled tree which will not split straight, or in which the split will twist around the tree, in opening. Furthermore, the tender plants are usually larger in diameter as they come up from the ground than are those which are tough and undesirable. The smaller slender seedlings with a tendency to showing woody fiber, or a gnarled appearance should be weeded out and thrown away, leaving only the plants which are largest in diameter and have the indications of tender plants which have been described above.

Growing Seeds for Starting New Plants.—One who has an asparagus patch already growing may also gradually improve his stock by selecting seeds only from those plants which have been shown to be best producers. It should be remembered however, that asparagus produces its pistillate or female flowers on one plant and its staminate or male flowers on a separate plant. If then, you allow the plants to seed in the patch all at one time, the pistils of your good producing seed plants are quite as likely to have been fertilized with pollen from the poorest plants in the patch as from the best ones. In order to be sure that your seeds are fertilized with pollen of staminate plants which were tender and good producers, the following course may be pursued. When the asparagus first begins to produce its sprouts in the spring, observe those which are largest, smoothest, and tenderest. Allow plants only of this type to grow without cutting for the table. Continue to cut the sprouts as usual from all the other plants in the patch. These few selected best plants will put up their stalks and go to seed before you cease cutting the crop from the remainder of the patch. Such of these selected plants as happen to be pistillates will produce seed, while those which happen to be staminate or male plants will not produce seeds, but they will furnish the pollen which fertilizes the flowers on the seed producing plants. Since you are keeping cut closely all the poor plants in the patch, you may be thus certain that the plants selected as seed producers were fertilized only by plants which were tender and succulent like themselves. These plants ordinarily will ripen their seeds in June or July and the seeds will be ready for gathering by the time the remainder of the plants which were cut for the table or for the market begin to blossom. The above is a certain way of breeding only from plants which are of the type you want to reproduce.

Division of the Roots.—Another way of multiplying the best plants in the patch is by the division of their crowns. An asparagus plant has a very broad spreading crown containing a good many buds. Any plant which shows unusual merit as it starts in spring may have this crown divided. Often a half dozen to a dozen plants may be separated from it. It is best to dig up the entire crown with as large a root system as it is convenient to handle. As the earth is shaken loose from it, one may observe sutures or natural division places in the crown between the buds. The plant may be separated into sections at these joints, so that each piece possesses at least a few buds and some good roots attached. These pieces may be planted out as individual plants, then as they become fully established, they will produce the same character of product as the parent plant from which they were separated.

Setting out the Plants.—Asparagus plants may be set out in autumn or in early spring. Usually, spring planting is best. They should be set deeply. Ordinarily, the crown should be set six or eight inches below the surface of the soil. Ordinarily, furrows are turned out with a plow four feet apart. Plants are set about two or three feet apart in the rows. If the furrows are turned deep, not much extra digging will be necessary to get the plants at the proper depth. They may be set deeper in a light mellow soil than in a heavy one. In the heavier clay loams of Missouri, it is often desirable to set them no deeper than five inches. In filling in the soil over the plant, the crown should not be covered more than two or three inches deep at first. The remainder of the furrow may be filled gradually after the plants get to growing well above the ground. If five to eight inches of soil is placed above the plants at the time of setting, they will be delayed too long in growing up or may even rot in the ground if it is a wet spring. Rows preferably should run north and south, so as to admit direct sunlight between the rows.

Cultivation.—Cultivation should be clean and thorough throughout the summer. Keep the cultivator going to prevent the formation of a crust on the soil after a rain, and to retain the moisture. Work the soil toward, rather than away from the plants.

In early winter, cut off the old stems giving a liberal dressing of old fine manure. Most writers advise applying this dressing during the growing season when the "plants can use it," as they say. In this section, better results may be obtained however, by applying it in the winter. It prevnts the soil from running together and hardening, and leaves the surface in good condition for early spring working.

As early in the spring as the ground can be worked, it should be plowed between the rows, turning the land onto the plants and leaving deep furrows midway between the rows. This throws up a ridge of fine soil over each row of asparagus. These ridges may be a full foot or more higher than the dead furrow between the rows. This ridge secures an earlier growth of the plants in spring. Ridged ground dries out, drains and warms up more quickly. The deep furrows between the rows will be about as deep as the crowns of the plants, so the ridges warm through the sides to the crowns. By ridging, additional surplus earth is also exposed to the sun, so more heat is absorbed. These ridges dry out quickly and therefore remain mellow and workable to facilitate cutting the asparagus without puddling the soil. Where the ground is left entirely level without ridging, it is likely to remain cool, wet and unworkable. Ridged in this way, the asparagus may be cut as soon as the tips of the sprouts show through the ridges. These ridges of mellow

soil bleach the asparagus. If green, rather than bleached asparagus is desired, it is better not to ridge the patch. The cost of cultivation is much less where the ridges are maintained along the rows. They may be turned up with a plow and cultivated with a light toothed cultivator or harrow. The ridges may be kept smoother and more symmetrical if kept dressed up with the garden rake from time to time. The ridges should be harrowed or stirred just after the asparagus has been cut, so the growing sprouts will not be injured below ground. Where level cultivation is given, it is impossible to harrow the patch at frequent intervals without danger to the sprouts which are just starting. This frequent harrowing during the sprouting season kills most of the weed seeds in the patch, which will sprout from time to time. When cutting for the season ceases, which will be in early June, the ridges should be worked down, leaving the patch level again. The plants are then allowed to make their normal growth throughout the summer, and should be given good cultivation to induce the best growth possible. This summer's growth of the plants after cutting ceases is essential in order that the plants may store up food for the followng spring. It should be borne in mind that all plant food to be stored in the crowns below must first be elaborated in the green growing parts of the plant above the ground. The ranker and greener the growth of the plants throughout late summer and early autumn, the more plant food they can elaborate and store in the crowns for the next spring's product.

Cutting the Asparagus.—Plants should be allowed to grow without cutting for the table until they are at least two years old. In this latitude, asparagus begins producing in early April, and cutting may be continued if growth is strong until June. All sprouts should be kept cut, whether they are big enough for market product or not. If the smaller stems are allowed to grow and leaves appear, the plants cease to produce more sprouts. The earlier cutting is stopped and the earlier the plants are allowed to make their summer's growth, the stronger they will become and the better condition they will be in for the following season. Ordinarily, one may continue to cut as long as the sprouts are long, large and desirable. In cutting, it is well to use an asparagus knife. The blade should be slipped down into the ground beside the sprout and the latter cut off near its base. Great care should be exercised not to injure the crowns with the knife or to cut off short sprouts not yet ready for the table. The sprouts should be washed in clean water. Water should not be used which is not suitable for drinking purposes, as cleanliness is essential. If washed with water from impure streams or contaminated wells, dangerous disease germs may be

disseminated on the asparagus. The asparagus sprouts should be tied in neat bunches for market. These bunches are usually made about four inches in diameter. The bunches are made to look neat by cutting off the bases of the longer sprouts after the bunches are tied.

Fertilizers.—The best fertilizer is stable manure. A great many advise the use of salt. It has been shown however, that the plants do not need salt for their own growth. Its only advantage is in helping to keep down weeds. Asparagus is native to salt marshes and can endure much salt without injury. While the salt will not benefit the asparagus, enough may be spread on to kill the other weeds without injuring the asparagus plants. Manuring should be done every year. The manure not only fertilizes the plants, but it keeps the ground mellow and enables it to withstand droughts.

Asparagus Rust.—In recent years, asparagus rust is becoming prevalent in Missouri. Efforts to keep down the rust by spraying have not been altogether satisfactory. Asparagus will resist rust perfectly however, if it has adequate water supply during the summer. Ordinarily, water enough may be conserved in the soil by annual manuring of the land and by frequent cultivation, so that rust will not be serious. Where it is possible to irrigate between the rows in a dry time, there is no danger whatever from rust. The Missouri Experiment Station has found that where the plants are properly irrigated between the rows, they will not suffer from rust, even in the driest summer, when unirrigated adjacent plants are almost destroyed by the rust.

RHUBARB, OR PIEPLANT.

(By Dr. J. C. Whitten, Professor of Horticulture, University of Missouri.)

Pieplant is one of our oldest, best known, most highly prized garden vegetables. It is one of the earliest to appear in spring, and consequently comes at a time when succulent or acid plants are most appreciated. As prepared for the table, it partakes in character of the nature of a fruit, being sprightly and acid like the berries. Its greatest use comes before the strawberry begins to ripen to take its place.

The soil requirement is the same as that mentioned above for asparagus.

The best varieties of pieplant are Linnaeus, Victoria and Mammoth. The Linnaeus is the first to produce in spring. It has smaller stems however, than the Victoria or the Mammoth. For that reason, Linnaeus is usually planted for the first early crop, to be followed by the later Mammoth and Victoria.

Plants may be secured from seed or by dividing the crows of old plants. Plants do not come true to variety from seed. The seedlings are very variable, some of them having small, slender leaf stalks and occasionally, one having the large desirable leaf stalks. On account of this variability, new varieties are occasionally secured from seed.

Ordinarily, it is best to secure divisions of old pieplant crowns for planting. These may be secured from the nurseryman, or by dividing good plants from any adjacent garden.

The plants may be set in either autumn or early spring. They should be set so the crowns are barely covered by the soil. If planted deep, the crowns are almost sure to rot during the hot weather of the first season. Plants should be set two feet apart in rows four feet apart for the home garden. In large commercial areas where it is desirable to cultivate the plants both ways, they may be set in check rows 3½ feet apart each way. Like asparagus, pieplant should be given thorough cultivation through the summer, and manured liberally every winter.

In pulling the leaf stalks for the table, care should be taken to pull out the base of the leaf stalk. Not infrequently, the leaf will be broken off at the surface of the ground, leaving a short piece of its base attached to the parent plant. The base of the leaf left in the ground will die and frequently begin to rot. This may induce a disease known as "stem rot," which attacks the stem and destroys it. Stem rot is the most serious disease of pieplant in this section. The two ways of preventing it are (1) to plant the pie plant near the surface of the ground, and (2), to be sure to get out the entire leaf steam in pulling the product.

Pieplant usually tends to go to seed shortly after its leaves are produced in the spring. These seed stalks should be kept broken off close to the ground as fast as they form. If the plants are allowed to go to seed, their strength tends to go to the seed rather than to the production of leaves.

After the pieplant has stood for 2 or 3 years, the crowns become broad and many leaves are produced. If allowed to become crowded in this way, the leaves after a few years will be small and spindling, due to their struggle for food supply. To prevent this, crowns should be divided every few years to prevent crowding in the hill. This division may be accomplished by cutting out some of the outer sections of the crown and root system. These sections make good plants to transplant elsewhere. Handled in this way, pieplant should be very productive and a profitable crop.

THE TIME OF PLANTING VEGETABLES.

(By Dr. J. C. Whitten, Professor of Horticulture, University of Missouri.)

The beginner often asks; "How early in the spring can I safely make my garden?" This question is founded upon the supposition that along in spring, there comes a day when it is best for gardens to be planted, irrespective of the species of plants that grow in them. Not infrequently, on the farm, it is customary to take a day off and make the garden. The idea is that once this troublesome job is out of the way, it will no longer interfere with farm work. There is no best day on which to make a garden, but there is a proper time for the planting of each species which is growing in the garden.

VEGETABLES REQUIRE DIFFERENT TEMPERATURES.

It should be borne in mind that different garden vegetables each have a different temperature requirement. Some do best in cool weather and in a cool soil. Others grow successfully only after the weather and the soil have become warm later in the season. Some of our garden vegetables are tropical plants, and need great heat for their growth; others are natives of colder countries and will not thrive well after the burning heat of summer comes on. Not infrequently, the grower fails entirely with certain vegetables because he plants all his garden vegetables at the same time. Some species may have been started much too late, and other species too early.

In gardening, it should be borne in mind that there are two extremes of temperature, above or below which garden seeds of any species cannot grow. The lower temperature is the freezing point of water or 32 degrees above zero, Fahrenheit. The higher temperature is something over 100 degrees Farenheit. In between these two extremes, each species finds a temperature at which it will make its best growth. This most favorable temperature is called the "optimum temperature" for that species.

EARLY, MEDIUM AND LATE SPRING GROUPS.

There are a number of species of vegetables which do best if started while the weather is cool. They will make growth at slightly above the freezing point, and they will endure more or less freezing without serious injury. Such species should be planted as early as the ground can be worked in spring. Among them are the following: Onions, garden peas, sweet peas, parsnip, spinach and salsify. In Central Missouri, these may be started in February or early March.

Another group which can be planted only slightly later, perhaps about the middle of March consists of lettuce, radishes, parsley and chard. These may be followed in late March or early April with carrots, beets, cabbage, cauliflower and potatoes.

The next group which may be planted between the first and the middle of April, consists of sweet corn, tomatoes and early garden beans. A still later group comprises those which will not make growth until the soil is warm, and which will be killed often by a slight frost. This comprises lima beans, okra or gumbo, cucumbers, melons, cantaloupes, peppers and egg plant. The latter should not be planted until late May or early June. They are vegetables which will not only be killed by frost, but if cool evenings prevail after they come up, they will even though not literally killed, be so stunted and injured by the cold as never to make satisfactory plants. This attention to planting so as to give each species its proper temperature is one of the most important points in successful vegetable growing.

GROW A SUCCESSION OF VEGETABLES.

Some of the vegetables mentioned above mature quickly, last for but a short season, and a succession of them should be grown in order to have them fresh for the table at all seasons of the year. Among those vegetables which should be planted once a month for succession are lettuce, beets, peas, carrots and radishes.

Radishes soon become pithy, woody and strong after they have reached proper size for the table. It is better to make repeated sowings a month apart. Lettuce soon goes to seed after it has reached its best maturity for the table, so young plants should be kept constantly coming on. Beets, particularly in this climate, become woody with age and lose their crispness and sweet flavor. Those to be started for winter should not be planted earlier than the first of August. Carrots are a delicious garden vegetable when young. One reason why they are not more often grown for winter storage is because they are usually planted in early spring and by autumn, they become so woody as to be unpalatable. Carrots for keeping over winter should be started in late July or early August.

While it is feasible to start some of these short season crops late for a winter supply of vegetables, it is equally as important to plant those which need a long season for maturity such as onions, parsnips and salsify as early as possible. Vegetables to be good should be pushed as rapidly as possible after they are planted. They should be given

frequent and thorough cultivation so they will make continual, rank, succulent growth. It is necessary to stir the soil as early as feasible after every rain to prevent the formation of a crust, and to aerate the soil.

GIVE THE GARDEN THOROUGH CULTIVATION.

Weeds should never be allowed to get a start. Once a garden of small vegetables becomes infested with weeds, it may be more troublesome and expensive to clean them out than the vegetables are worth. Furthermore, vegetables that struggle for a time in competition with weeds or in a crusty soil are frequently so weakened in their growth that they may never give satisfactory returns. In order to facilitate best handling of garden soil and early planting, the land in this climate should be plowed in the fall. The winter freezing flocculates the soil, rendering it mellow and workable in early spring. The higher points of the surface of autumn plowed land will dry out so as to facilitate harrowing and planting in spring long before unplowed soil can dry out deep enough for proper plowing.

Barnyard manure is the best garden fertilizer. It not only furnishes essential plant foods, but it makes the soil mellow, porous and easily worked, and prevents crusting of the surface and renders the land more drought resistant.

Where soils are firm and compact below, subsoiling is usually desirable. Subsoiling is accomplished by running a subsoiler or single shovel in the furrow behind the plow; the design being to stir up and loosen the subsoil in the bottom of the furrow without turning this subsoil to the surface. It is frequently desirable to mulch certain garden vegetables through the hot weather of summer with straw, new mown grass or other vegetable material. Mulching is particularly beneficial to such crops as sweet peas, potatoes and tomatoes.

GROWING CUCURBITS.

(By Dr. J. C. Whitten, Professor of Horticulture, University of Missouri.)

The cucurbits, including cucumbers, cantaloupes, melons, etc., have similar requirements, and are all cultivated very much alike. They require a light, mellow, warm soil. A sandy loam is best. If grown in a heavy clay loam, it must contain much vegetable fiber in order to make it loose and spongy. They are fairly rank feeders, and the soil should be rich. Indeed, much of the damage done by insects and diseases will not be noticeable if these plants have enough soil fertility to keep them

growing rapidly from the start. On the other hand, grown in a poor soil so the plants are weak, it is almost impossible to keep them free from insects and disease. Sod land turned under is an excellent place for these vine crops.

As a rule, land should not be planted to any of the plants of the gourd family for more than one year in succession. This is particularly true of watermelons. If watermelons are planted more than one year in succession, the grower rarely ever realizes profitable crops. Growing plants of the gourd family then, should be part of a general farm rotation; growing a single crop of the gourds and following this with such crops as corn, wheat and clover. The farmers are finding a good rotation to be melons, or one of the gourd group, corn, wheat, clover and then melons again.

The land should be plowed in the fall if possible. It should be harrowed and worked carefully in spring from the time it becomes workable until the melons or other gourd crops are planted. This will kill most of the weeds and will settle the soil fine and compact below, leaving a good seed bed on top. The cheapest cultivation that can be given such a crop is the disking and harrowing of the soil by way of preparation before the crop is planted.

None of the gourd crops should be planted until the weather and soil are warm, as none of them will stand frost. Ordinarily in this State, they may be planted during the last half of April or very early in May. They are usually planted in check rows; the distance apart varying from 5 or 6 feet each way for cucumbers to 8 or 12 feet apart for melons. Perhaps the most convenient method is to cross-furrow the land at the distances suggested above. Where the furrows cross, the hills can be made. The earth should be scooped out and a shovelful of manure applied if it is available. The soil is then thrown over this manure so the top of the hill is level with the surrounding soil. Six to twelve seeds should be planted in each hill in order to secure a full stand of plants, and also to give opportunity for selection of the best plants, when the poorer ones are thinned out. When the third or fourth leaf is well developed, the plants should be thinned, leaving four plants to the hill for cucumbers and one or two for melons.

The early cultivation may be fairly deep, while the plants are young, and before their roots begin to spread. Not infrequently early in the season, rainy weather may prevent cultivating until weeds get a start. If the early cultivating is deep, these weeds may be more readily killed if they once get established. Later cultivation should be shallow so as not to break off the roots of the plants, once they begin to spread

out between the rows. In order to maintain shallow cultivation, it should be frequent. After every rain, the crust should be broken as quickly as the land can be worked.

Frequent cultivation, early, lets the spring rains soak into the ground, instead of allowing them to wash off from the surface. This enables the grower to store up the early rains of the spring deep into the soil below. The shallow dust mulch maintained on top later in the season saves this moisture in the soil, so it will be available for the plants during the dry weather of July or August.

The most common insect enemy of these crops in this section is the striped cucumber beetle. Usually, this insect may readily be kept in check if the soil is rich so the plants grow rapidly, and if frequent cultivation is given to keep the dust on the surface. The cucumber beetle does not like dust. On small areas, he may be kept down by sprinkling air slacked lime or ashes around the hills and re-applying it after rains have wet it down. In large commercial areas, the growers depend upon soil dust maintained by cultivation to drive the insect out of the field. On a dry day, cultivation may begin on the side of the field next to the wind, when the insect, to escape the dust will go with the wind across the field. Following up this cultivation will drive the bulk of them off the field entirely. The fine dust maintained on the surface and scattered over the plants will prevent his return until the dust is laid by subsequent rains. As the vines begin to run, cultivation can be continued only in one direction; the vines being laid lengthwise of the cultivated rows.

The gourd crop on thin soils responds to artifical fertilizers. The fertilizer should contain nitrogen, phosphorous and potash. The proportions vary somewhat with the character of the soil. Most of our Missouri soils contain abundant potash for most farm crops. The gourd family, especially watermelons, feed abundantly on potash however, and ordinarily they will respond well to its application. A mixture that will contain the equivalent of the following will be found adequate to most Missouri soils: 100 lbs. Muriate of Potash, 75 lbs. bone meal, and 75 lbs. Nitrate of Soda per acre. If desired, the equivalent may be secured through the use of Sulphate of Potash, Acid Phosphate and dried blood. It is more economical, however, to keep up the fertility of the soil by using clover frequently in the rotation. Where barnyard manure is available, no other fertilizer will be needed.

SWEET POTATO GROWING.

(By Dr. J. C. Whitten, Professor of Horticulture, University of Missouri.)

While the sweet potato reaches its best yields towards the south, at the same time it may be profitably grown in Missouri. A fair yield may be expected on almost any ordinary farm land. Some of our richer bottom lands are less well suited to its profitable development than are the uplands of moderate fertility.

The plants make excessive vine growth, and the potatoes are less desirable in quality on the richest, heaviest soils. A loose, light soil tending towards sandiness is preferable. At least a fair yield may be had however, on almost any well drained land that will grow an ordinary corn crop.

Varieties.—Among the varieties most usually planted, are the Nansemond, Jersey, Cuban Queen and Vineless.

Propagation.—Sweet potatoes are propagated by means of sprouts, or draws produced in hotbeds from sweet potato tubers. The hotbed should be made in early spring, and the sweet potatoes imbeded, lying close together in a layer and covered with 2 or 3 inches of soil. As soon as the sprouts are well up, they may be broken off close to the sweet potato, each containing a few roots near the base, and planted out. If desirable, these draws may be made into cuttings and a larger number of plants thus secured. The cuttings are made long enough to contain three buds; one bud at the base of each cutting, and two above. These cuttings may be rooted by inserting them an inch apart in rows 5 or 6 inches apart in soil or sand in the hotbed. Cuttings should be set deep enough so that the upper bud will be above the soil. Root will quickly be produced below—especially from the vicinity of the two buds which are beneath the soil.

Preparation of the Field.—The land should be plowed to a good depth and thoroughly harrowed and pulverized. The aim should be to give level culture.

Planting.—If possible, the time selected for setting out the plants should be when the soil is fairly moist, but not wet enough to be sticky. Plants should be set 2 feet apart in rows 4 feet apart. Many growers set by turning the furrow with a turning plow; dropping the plants in the furrow and covering with the loose soil which was turned out. Other growers simply mark the rows with a marker and set the plants with a spade. The spade may be inserted in the soil and pushed forward, leaving the space for the plants and its roots behind the spade. The second person inserts the plants behind the spade to a good depth, and when

the spade is withdrawn, the soil is pressed firmly back against the plant with the foot.

Cultivaton.—Frequent and thorough cultivation should be given. On very wet land, it may be desirable to grow the plants in ridges. Level cultivation, however, is preferable on most soils. Cultivation may continue until the vines cover the ground. In the later cultivatings, growing vines will be dragged lengthwise of the rows. A little later, they will branch laterally so as to cover all the space between the rows and keep down weeds.

The question is frequently asked whether it is best to pinch off the tips of the vines to induce tuber formation. With the same question in mind, some growers advise coiling the vines around the hills so they will make length growth less rapidly. These methods of checking length growth probably do not pay under average conditions. It is usually best to allow the plants to make their own natural growth.

The potatoes should be dug just before frost. If a frost accidently catches the vines, digging should be done as soon as possible.

Storage.—Sweet potatoes are among the most difficult root crops to store successfully. The most important factors to secure successful storage are never to bruise the sweet potatoes; to keep them dry, and to prevent extremes of heat or cold. Since bruises induce rot, the sweet potato should be handled with great care in harvesting. The sweet potatoes should be allowed to dry thoroughly after digging. For that reason, it is well to dig in the forenoon of a sunny day and pick them up in the afternoon after their surfaces have dried. If the weather is very wet so it is difficult to dry in the field, it becomes desirable, if possible, to dry them spread out under shelter before storing.

Sweet potatoes may be stored by pitting them in the field or in specially constructed potato houses or storage rooms. Sweet potato storage houses or storage cellars should be well ventilated. Sweet potatoes should be put in bushel crates, and stored in ricks with inch spaces between the crates to keep the potatoes ventilated and dried out. One inch strips of board may be placed on each tier of crates to give ventilating space between the tiers. In pitting in the field, a dry position should be selected, so as to avoid surface water. Potatoes may be piled in a conical heap or in a long rick. The heap or rick should not be more than 4 feet wide on the ground and 2 feet high. Potatoes may be then covered with straw, and just enough soil added from time to time to keep them from frosting. Ample ventilation should be left at the top of the pile, however, for all steam and heat to escape, and to prevent sweating or heating of the potatoes.

EFFECTS OF A FREAK SEASON ON FRUIT TREES.

(By Miss Mary E. Murtfeldt, Kirkwood, Mo.)

Last year, over a very considerable area of the Mississippi Valley, was characterized by such unusual weather that it may, without exaggeration, be termed freakish.

The entire month of March and the greater part of April, in St. Louis county, at least, was with scarcely a touch of frost and only two or three light showers and many days were of midsummer temperature. The effect on orchards and gardens was unprecedented earliness, a transcendently lovely and profuse blossoming season and corresponding setting of fruit.

When the deadly freezes, with sleet and snow came, April 23rd to 25th, tree fruits were already of sizes ranging from one-half to two-thirds of an inch in diameter, the peaches having all shed the protecting calyx. Currants were almost of full size and many early vegetables ready for the table. A week later there was not an apple, pear, plum or peach on the trees; currants appeared as though cooked and the centers of all berries were black. Tree foilage of all kinds was crisped and blackened and soon dropped off. Beans, tomatoes and tender ornamental annuals were cut off. The destruction was even more general than in 1894, in which the spring was of similar character, except that the frosts occurred three weeks earlier.

The cool weather and copious rainfall of last May and throughout the summer soon restored fresh verdure, in fact the vegetative growth was too luxuriant, but there were but few cases of second blossoming except on the mulberries and some of the ornamentals.

It would seem that benefit must accrue to the crops of several succeeding years from last spring's catastrophe. Throughout St. Louis county, and probably over much other territory, all fruit feeding insects seemed to have perished; not a codling moth or curculio came under my notice during the summer. Canker worms and other early hatched foilage feeders were not in evidence and on apple, pear and plum trees, so far as our own little suburban orchard was concerned, very little insect work of any kind was noted throughout the summer. Furthermore, there were no rusts or leaf spots, no leaf nor fire blights. Not a branch of even the most susceptible pears was blackened by this uncontrolable disease, not even on one or two trees from which the previous year's blighted branches had not been pruned.

Of course, no fruit having developed, our entire crop consisted of two specimens from two belated blossoms. There were no rots nor rusts nor scabs.

Will the germs of these live over an entire season to reappear next summer? It seems hardly possible, on our grounds at least, and there are no nearby orchards. But nature has many resources, so we await developments with some anxiety as well as interest.

Almost the only trouble that it seems reasonable to anticipate is an outbreak of fruit tree Aphids, and this on the ground that individuals of the egg laying forms appeared quite numerously on apple and plum leaves during the autumn, and, here and there, by close examination, the black, shining eggs may be discerned on the bark of twigs and branches. This may not result in the appearance of these pests in destructive numbers, but it will do us no harm to be prepared to combat them, on their first appearance, with dust sprays and those of tobacco extracts and infusions, which are less defacing to the trees than kerosene emulsion, and usually effective.

CELERY GROWING.

(By Dr. J. C. Whitten, Professor of Horticulture, University of Missouri.)

Celery is profitably grown only on a very rich soil. A deep, rich mellow loam is best. Almost any good farm land will produce good celery if heavily manured. If land is thin or sterile to begin with, a season or two will be required for previous preparation to get it in shape for celery growing. This previous preparation consists of deep plowing and even subsoiling where necessary, together with abundant manuring. If fresh manure is used, it should be plowed in to allow it to become thoroughly incorporated with the soil. If old, well rotted manure is available, it may be applied annually.

Celery should be started in a seed bed, and twice transplanted. The seed should be sown in February for a very early crop, or in March for a winter crop.

The best early varieties are the White Plume and Self Blanching. Good winter varieties are Golden Heart and Giant Pascal. The seeds are slow to germinate. They should be started in a prepared soil in a hot-bed or forcing house. They are tiny seeds, and should not be sown deep. It is perhaps best to sow them on top of the prepared soil and cover them with ¼-inch of sand. When the young plants are well up and putting out the third or fourth leaf, they should be transplanted in a prepared bed or cold frame four inches apart each way. At this transplanting, they may be set deep enough so the seed leaves will come just above the surface of the ground. Here they should be watered as necessary, and all weeds should be kept down until they are ready to

go into the open field. In order to keep them short and stocky, it is best to clip the leaves back every few weeks.

For an early crop, celerly may be transplanted to the field in late June or July. For winter use, it may be put in the open field in August.

The most economical arrangement in planting the field is to plant three or five rows in a strip, the rows being 7 inches apart and the plants 7 inches apart in the rows. Then a vacant space of at least 8 feet should be reserved and another 3 to 5 rows of the plants set. The 8 feet of open ground between the strips or belts of celery rows is for the purpose of getting soil enough for blanching it later on. Transplanting will be more successful if done in cloudy weather, and especially just before a rain. When the leaves of the plants are 6 inches long, they will be large enough for the earthing up and blanching to begin. The leaves of the plant should be gathered upright into a straight bundle. Soil should be drawn in around and between the plants until the leaves are covered within a few inches of their tips. Only the upper ends of the leaves should be left exposed to the sun above the ridged soil. Care should be taken not to get the soil into the heart of the celery as it may rot it. As the leaves increase in length a few inches, additional soil should be again banked around them. This repeated earthing up should be performed until growth ceases upon the approach of cold weather. Whenever earth is banked up around the celery, care should be taken to leave it in such form that it will shed water. If the embankment is left low in the middle, rains may get down into the hearts of the plants and cause them to rot.

In order that the celery may stand as late as possible for winter, the tops of the leaves should be covered with straw in cool times to prevent injury from frost. There are several ways of keeping the celery from freezing for winter use. One is to leave plants in the soil embankment where they grew; mulching the tops with sufficient soil and straw to protect them from frost. Another way is to pack the celery plants in boxes and keep them in a cool cellar. Two or three inches of soil should be placed in the bottoms of the boxes. The plants may then be dug up with their root systems intact, and their roots set in the soil in the bottoms of the boxes, so the plants will stand upright and close together, filling the boxes.

If large quantities are to be stored, the plants may be set in three inches of soil directly on the cellar bottom. Another successful way is to set the celery in a small celery house provided for the purpose. A good celery house may be made as follows: Make a roof-like structure 5 feet wide on the ground with A-shaped double rafters coming together

four feet above the ground at the center. This may be broader up on the outside forming a roof or protection. Each upper board should have its lower edge overlap the upper edge of the board below it. This forms a tight roof over the celery which will protect it from rains. The soil may then be prepared beneath this celery house, and the plants set in close together as described above for setting in boxes or on the cellar bottom. The plants may be further protected from cold by covering the house with straw, strawy manure, or earth.

Ventilation should be left at either end of the house until severe cold makes it necessary to close it up entirely. Plants may be taken out of such a house in winter any time as needed for the table or for market.

CELERY CULTURE.

(Note.—The following article was written by a practical gardener, but the author's name has been lost.—*Secretary.*)

In speaking on the subject assigned me, it is not my intention to give you a scientific treatise on celery culture; we will leave that to the professors. I will try and tell you, in as few words as possible, our method of growing the crop.

Our acreage is small, in comparison with some of the great celery plantations found in favored locations. We have out this year about sixteen acres, between early and late. We make no claim for originality nor do we claim that the method used by us is better than that used in other sections of the country.

VARIETIES GROWN.

For the early crop, we plant White Plume; it is a strong growing, vigorous variety, much less subject to blight than the Golden Self Blanching. For second early, or mid-season, we plant White Plume, Golden Self-Blanching, Fin-de-Siecle, and Giant Pascal, from field grown plants. We try to have the early crop disposed of by the time we commence trenching, about October 20th. We are then ready to work on the later planted White Plume and Golden Self Blanching. By the time that is sold, the Fin-de-Siecle and Giant Pascal are sufficiently blanched. These varieties will run us through the holidays. By the first of the year the late varieties are ready. For the late crop we have practically abandoned Winter Queen, Schumacher, Perfection Hartwell, and all the rest, for French's Success, a variety of rather recent origin, introduced by the Joseph Harris Seed Co. It is one of the most uniform varieties of

Celery we have ever handled. It is a slow-growing compact variety, and should be planted earlier than some of the taller growing kinds. It is a long keeper and full-hearted; I have counted as high as fourteen shoots starting in the heart, where in Giant Pascal only one or two would be visible. The quality is good, but not equal to Giant Pascal.

SEED SOWING.

The seed for the early crop are sown in the greenhouse, March 1; we have found that if sowed much earlier the plants are liable to run to seed. The soil for the seed bed is composed of well rotted manure and dirt, about half and half. The seed bed is sterilized by saturating the soil with a solution of formaldehyde, two pounds to five gallons of water. When the soil is dry enough, screen it through a sieve of one-fourth inch mesh. Press the soil down firmly and mark off the rows two inches apart and not more than one-fourth inch deep. The day before sowing, sterilize the seed by washing it in a solution of two ounces of copper sulphate and one-half gallon of water. The seed is then placed over hot water pipes to dry.

Sow thinly in the drills, and cover lightly with fine sand. The bed is then covered with burlap and given a thorough watering, using water from the hot water system. Water occasionally as needed, and when the seed germinates remove burlap covering, and give the bed a thorough watering. Keep the soil slightly loosened between the rows, and if more water is required before plants are large enough to transplant, pour the water between the rows; avoid wetting the leaves.

When the rough leaves appear we commence transplanting. The plants are set one and one-half inches apart in flats, and are kept in the greenhouse until well established. Before removing to the cold frames the plants are sprayed with Bordeaux mixture. Unless the frames are steam heated we place one-half foot of fresh horse manure in bottom of frame, tramp down firmly, and place the flats upon the manure.

The plants are kept growing nicely, but are not hardened by exposure to severe weather, as in the case of cabbage. They are treated more like tomato plants; the frames are well ventilated, and sash removed during warm days. Considerable care is exercised in watering the plants; the soil in the flats should never be allowed to become so dry that the plants will wilt, nor enough water applied to saturate the soil. The plants are transplanted to the field about the middle of May.

SOIL PREPARATION.

Stony land or land with a loose, gravelly subsoil should be avoided otherwise almost any kind of soil will grow good celery. Muck land is undoubtedly the ideal soil for celery, but few of us are so favorably situated; hence we will have to use such soil as we happen to have. The important thing is to have the land well filled with humus, and in good friable condition.

It has been our custom to apply forty or fifty tons of well-rotted manure per acre during the winter. As soon as it is dry enough in the spring we go on the field with a four-horse cutaway harrow, and cut the ground over three or four times. The cutaway is then followed by the smoother, Acme harrow, and roller, and the ground worked until the manure is well mixed with the soil and the ground free from lumps, and in fine mechanical condition. The field is then plowed, and the other side worked the same way; the finishing touches are then put on with a Meeker smoothing harrow. Rows are marked off two feet nine inches and the plants are set five or six inches apart in the row.

TRANSPLANTING.

The plants are pulled and most of the dirt shaken from the roots. The roots are then well puddled in rather thick mud, placed in boxes and hauled to the field. Dibbers are used in setting, care being taken to see that the soil is well firmed around the roots, and the plants set no deeper than they grew in the flats. Under favorable conditions an experienced man will set from 1,000 to 1,500 plants per hour.

After the plants have started to grow we go over the rows with a Planet, Jr., two-wheel hand cultivator, having on disks, or small plows, set to throw away from the rows. The crust is then broken up between the plants with handweeders, or narrow hoes, at the same time uncovering those plants which were set too deep. The field is then cultivated with a riding cultivator, which is kept going often enough during the season to maintain fine soil mulch two or three inches deep. No dirt is thrown against the celery during warm weather, as it is liable to cause the celery to rust. After the first cultivation, a ton of high grade fertilizer is applied along the rows with a McWhorter distributer.

The plants are sprayed with Bordeaux mixture two or three times before setting in the field and about every two weeks thereafter.

BLANCHING.

The celery should be large enough to commence blanching by the middle of July. For this purpose we use straight grained hemlock boards, sixteen feet long, twelve inches wide, and one inch thick. A cleat is nailed on each end of the board to prevent splitting. In boarding up the celery we put up boards to two rows, then skip four or six rows, put up two more rows, and so proceed. The boards are held in place by wide clamps made of galvanized wire.

When the celery is blanched the boards are taken down and put up on the adjacent rows. The celery is dug with a spade, the dirt shaken from the roots, and the outside leaves stripped off, leaving nothing but the blanched stalks. The roots are then trimmed off with a knife—four sided and to a blunt point. The celery is hauled to the bunching shanty, where it is tied in flat bunches of three or four stalks, washed, and packed in crates.

PLANTS FOR LATE CROP.

The seed for the second, early and late varieties, is sowed in the field as early in the spring as the ground can be worked.

The soil is put in the best possible condition. The seed is then sowed rather thickly in drills fourteen inches apart. Set the drill to cover the seed very lightly. After the rough leaves appear, the plants should be thinned out so as to stand one-fourth to one-half inch apart. They are kept well cultivated and no weeds allowed to grow. When the plants are about half a foot tall, they should be cut back a couple of inches with a scythe in order to keep them stalky. Set in the field as soon as large enough or as soon as the land is available. The late celery usually follows an early crop, such as spinach, peas, early beets, cabbage, etc. As much care is exercised in preparing the soil for the late as for the early varieties.

The plants are set six inches apart in the rows, and the rows are three and one-half feet apart to allow room for banking up.

HANDLING AND TRENCHING.

The late varieties are worked in the same manner as the early crop, until the latter part of September, when the handling process begins. Before handling, a cultivator is run between the rows to make the ground fine and loose; another cultivator immediately follows with the side shovels on, set to throw the dirt toward the rows. The men then get on their knees between the rows, and, holding up the leaves with one hand,

with the other, shove up a handful of dirt around the bottom of the plants to hold the leaves in an upright position.

Immediately after the handling, a Planet, Jr., celery hiller is run between the rows, and the dirt thrown up at least six inches around the plant. Later on we go through once again with the hiller, when the dirt is thrown up as high as possible. Nothing more is done to the celery until trenching time.

We commence trenching White Plume about October 20th. The process consists simply of digging a trench about a foot wide and deep enough so that when the celery is placed in the trench, the tops will stick out about two inches. For digging the celery we have an attachment made at the blacksmith's similar to our onion set harvester, which is fastened to a two-horse riding cultivator. The celery is then pulled up by hand, most of the dirt shaken from the roots, and the broken or decayed leaves and suckers pulled off. It is then carried to the trench where a man in the trench packs it tightly in an upright position. No dirt is placed around the roots.

The boards used in blanching the early crop are nailed together "V" shape, and placed over the trenches to keep off rain and prevent the sun and wind from wilting the celery. One of the secrets of keeping celery is to keep the tops dry. Manure is then placed in piles along the trenches. On the approach of cold weather, a little manure is placed along the bottom of the boards, and when the weather becomes very severe more manure is added. We seldom put more than two inches of manure over the boards.

For a number of years, we have been irrigating part of our celery. For this purpose we use a Knowle's No. 6 pump and a 20-horse power boiler. The pump has a three-inch suction, and a two and one-half inch discharge. It will throw, under our conditions, from 100 to 150 gallons per minute. A two and one-half inch discharge pipe is run along one side of the field; from this pipe two-inch laterals are run 120 feet apart. Two-inch valves are placed 100 feet apart on the laterals. A fifty-foot length of mill hose is fastened to the valve, and the water allowed to run between the rows.

This season we tried two acres with the Skinner system, and are so well pleased with the results that we will use this method altogether in the future.

RASPBERRY CULTURE.

(By L. Coutant, Monett, Mo.)

All over the universe, the raspberry is recognized as one of the best flavored fruits. Besides its aroma, the dainty appearance, especially of the red and yellow varieties, makes the raspberry quite a favorite with almost everybody. Any family that cares for a garden might plant a small plot, at least, with a few bushes of this enjoyable fruit.

Raspberry culture is generally restricted to small areas everywhere. The lack of extension of this crop is probably due to the small size of the berries, and the supposed slow work of picking. Since many of the new varieties are considerably larger in size than the older ones, this fact may have a tendency to promote more general interest in a wider cultivation of this fruit. As a rule, here in the southwestern part of Missouri, the raspberries, by good culture, and with sufficient winter mulching are much less affected by frost, and are a more certain crop than strawberries.

The soil for growing raspberries should be made as rich as possible before planting by using stable manure freely with a reasonable addition of commercial fertilizer. The phosphates seem to give the best results. However, the grower should be very cautious not to use an excess of lime or potash. The soil must be kept fertile. While they will produce fairly well at first, they soon become exhausted and the plants grow smaller and weaker where heavy crops are taken off without enriching the ground.

Raspberries ought to be located as a rule in a gravelly, well drained soil, and as a rule, they do best in moist places. However, for success in growing either the black or red raspberries, it is quite necessary to have land that is free from standing water. It is possible to grow raspberries on hill-tops and high ridges, but the yield will be much less than if grown in the valleys. As a rule, the crops will be more certain upon the hills, but the amount of berries produced will be smaller. The valley lands, owing to their moisture and richness, make fine large plants, but there is great danger of injury from spring frosts. On the whole, a raspberry plantation will be more profitable in the low rich places.

Where it is necessary to grow the berries on clay land, conditions could be made favorable by tile draining the soil. On a small scale, the rows may be ridged up somewhat so that the plants will be slightly elevated. This will afford better drainage, and make a warmer soil. This method is to be recommended if the soil is inclined to be poorly drained. In a wet season, plants could be grown by the method mentioned when

perhaps there would be little or no fruit during a wet season upon the same land.

In my experience, I have found spring planting to be the most successful. If set in the fall, the plants are too apt to dry out during the winter. This is certain to be the case if the late fall and early winter are dry. Raspberry plants cannot stand the cold dry winds of winter unless they are well established in the soil, and have their roots in contact with moisture. In planting raspberries, it should be remembered that it will not do to set them during cold weather. They will make a much better growth by waiting a while until the soil has dried sufficiently so that it will work well, and it has become warmer. As to the distance apart for planting, in my opinion, they should have plenty of room. If they are to be cultivated in the common way, that is, in one direction only, the rows should be from six to seven feet apart, and the plants from two to four feet apart in the rows. Large growing varieties like the Cumberland, need to have the maximum amount of room, that is, rows seven feet apart, and plants four feet apart in the rows. For the small varieties, set them three by six feet, which will give them plenty of space.

Black-cap raspberries.—These are best planted in the spring. The rooted tips of this class of raspberries should be set very shallow. The reason for this is that the spring rains are very apt to drown them out if the buds are not just at the surface of the ground. As a rule in southwestern Missouri, clay land with a slight admixture of gravel is the best soil. Such a soil will successfully retain its moisture even during dry weather. In this respect, it is better than the gravelly or sandy soils.

Since the blackcap raspberries do not spread by means of sprouts from the roots, they can be set at definite places with the expectation that they will remain there. The rows should be about six feet apart, and the plants on the average about three feet apart in the rows. The new growth from the plants year after year comes from the crowns of the old root system, and hence in cultivation, the soil should not be dragged away from the hills, as this would leave the crowns above the ground, and greatly weaken them because they would have a tendency to dry out.

Black-cap raspberries propagate or reproduce themselves by means of root tips. The ends of the long branches droop over and touch the ground, and take root if the soil is moist enough to allow them to penetrate the surface. To encourage the rooting of the tips of the branches in order to produce new plants, the soil should be kept loose and fine and in addition, the branches may be covered by shoveling earth upon

them four or five inches from the end. In layering black-cap raspberries to cause them to root, it is a mistake to bury the tips of the canes as the length growth may not be at that time completed. By covering them a few inches from the end, they can continue to grow if necessary and will yet be against the ground so that they can readily take root. They take root in August or September.

Black-cap raspberries must be pruned severely in order to make them resist strong winds, and also to cause them to develop lateral branches. Along in June, when the young plants are about two feet high, cut them off to a height of one foot from the ground. Allow three or four canes to the hill. The fewer canes there are remaining to grow, the better they will be. For this reason three stalks are better than four, and two would make a better growth than three, although this would reduce the quantity of fruit produced. It is usual to leave three or four stalks. Later on, after the side branches have grown out, these should be cut back to one foot in length. They will probably make more growth after this, so that the following spring, it will be necessary to again shorten them, so that they will not be more than one foot long.

Immediately after the fruiting season is over, the old canes should be cut out as near the ground as possible and burned. This not only gives more room for the new plants to develop, but this will greatly lessen the danger of injury from anthracnose, the worst disease of this fruit. Black-cap raspberries in this part of the country are not as long lived as the other kinds.

Varieties of Black-caps.—So far the best varieties of the black-caps that we have tested in our locality are the Cumberland and Munger. The Hoosier is very inferior in size, and not to be recommended. So far with us, both the Cumberland and Munger make healthy plants and healthy fruit. Up to this time, anthracnose has not yet made its appearance on them. The Kansas is an old standard variety of black-caps, which thrives on a great variety of soils. The Gregg is another of the old time varieties that is yet largely planted. The Evans is not so well known as the others mentioned, but wherever it has been tried, especially in the heavy clay soils in the central part of the State, it is a splendid producer. However, the plants are not as hardy as the Kansas and Gregg. The Ohio is a standard variety used for evaporating purposes. The fruit of the Ohio is not very juicy to begin with, and therefore, is more easily dried in the sun or artificially evaporated than any of the others.

Red Raspberries.—This type of raspberry produces a soft fruit, which is much more difficult to handle, especially to ship, than the black-

caps. However, the red raspberries are a favorite for eating when fresh. As a dessert fruit, many people prefer them even to strawberries. The flesh not being firm, they are not canned very successfully, and are not very well thought of for cooking purposes. However, the red raspberries are earlier than the black-caps, and will nearly always find a ready sale in a local market. The earlier sorts of red raspberries are often sold for from $1.00 to $1.50 per crate, of twenty-four quart boxes, more than the black-caps.

For the best success in growing red raspberries, if possible, they should be planted in a gravelly clay soil, which has been manured freely. It would be a good idea to add bone meal, a little potash and some lime. The plants should be set shallow, especially if the soil is likely to bank up against the plants after a rain. Lay off rows seven feet apart, and set the plants four feet apart in the rows. The distance apart in the rows will vary somewhat according to the variety. Those that are known to be strong growers should be set farther apart. If the soil, or subsoil is gravelly so that there will be good under drainage, the rows should not be ridged. However, if the soil consists of a great deal of clay, then it may be necessary to ridge up to some extent. If the soil is well drained, it is best to keep the ground level.

In cultivating, the plants should be kept in hills. Since the red raspberries sprout from the roots, suckers will come up everywhere. In a patch where fruit is wanted and not plants, all of the sprouts outside of the regular hills must be regarded as weeds, and kept cut out accordingly. Of course, if new plants are wanted, then all the sprouts along the line of the rows may be allowed to grow for one season.

If the grower has plenty of land at his disposal, best results could be secured by planting the berries in hills four feet apart each way. By this method, they may be cultivated in both directions with a horse cultivator, thus greatly reducing the cost of hoeing and spading. In a first class plantation, my idea is that the plants must be spaded around once a year.

Cultivation will have to be frequent during the season, although all plowing and hoeing should cease by the middle of August. In some seasons, it may be necessary to cultivate somewhat later, and if full growth has been secured earlier, then cultivation may cease before the middle of August.

It is not necessary to prune the red, yellow or purple raspberries. The writer has tested this pretty thoroughly throughout several seasons, and has found that the plants that were not pruned were always larger, and bore the most fruit. The only pruning to be given is in the

spring when the old canes should be shortened back if too long. The tips of the purple raspberries (since these propagate like the black-cap berries), will strike into the ground more readily and will succeed infinitely better if they have not been pruned. These usually strike root at the tips in August or September in the latitude of southern Missouri.

Among the raspberries, the red and yellow kinds easily take rank above all other sorts because of the beauty of their fruit. The fruit from the yellow and red sorts have lustrous appetizing colors, and are well fitted for the adornment of plates or fruit baskets. They also rank high on account of their quality and flavor, especially in the tender varieties. Thus it is not surprising that in olden times these sorts took first place in the choice of the epicures.

Varieties of Red Raspberries.—Among the varieties of red raspberries the Immaculate takes first rank for size, hardiness, color and disease-resisting qualities. Crimson Beauty comes next. The fruit is of fair size, and the canes are reasonably sturdy and strong. This variety is remarkable for its hardiness. This is a good sort to plant in connection with the Immaculate.

Ohio is a slow grower. Plants that are two years old have not yet given us any fruit. The Luby is not hardy, and the same may be said of Eaton and Herbert. The Eaton produces large berries of a deep red color, and it is one of the best bearers. However, in southwest Missouri, we have had to discard this variety because it has been a poor plant maker, and because of its lack of hardiness.

The Herbert rusted badly this year. So badly, in fact, that the plants were quite worthless. Also, as stated above, it is not hardy. The Brilliant, from Ohio, yields well, but is too small to be valuable.

The Superlative is a very fine variety imported from Europe. Unfortunately, the Superlative is not hardy enough to make it valuable for anything but home use. At the end of the picking season with us, the fruit was still very large, possessing a deep red color, and the quality was of the best. Of the tender sorts, this has proven to be perhaps the best of all. The Superlative must be well protected during the winter. There is no other variety that has such large canes as this one, unless it be the purple sorts, but the Superlative requires age in this locality to produce its best results. On the whole, this variety is worth while in the home garden, but not for commercial use.

The Loudon, Cuthbert and Turner are old standard varieties of red raspberries. The Red Antwerp is quite widely planted. The Miller is also quite well known.

Purple Raspberries.—There is a hybrid or cross between the red

and black-cap raspberries, which is known as the Purple Caned sort. In general appearance they resemble the red raspberries very much so far as the plants are concerned. However, unlike the red raspberries, they never throw up suckers from the roots. Their method of propagation is from the root tips like the black-caps. Similar to the black-caps, the tips of the branches touch the ground and take root, and these may later on be taken up and re-set.

Varieties of Purple Raspberries.—In southwestern Missouri, the Cardinal and Haymaker are the leading varieties. Both of these sorts have the good habit of producing fruit one year after planting. Afterwards, the berries are inclined to degenerate in size. The yield also grows less and less. The fruit of these varieties is palatable enough but is rather too soft, and the color is unattractive. They are desirable only for commercial purposes. It might be added the Cardinal is better than the Haymaker, and is rapidly superseding the latter.

An old standard purple variety is the Shaffer or Shaffer's Colossal, as it is sometimes known.

Yellow Raspberries.—The yellow raspberries are merely a variation in the color of the fruit of the regular red raspberries. Several varieties of more or less yellow fruited red sorts have been placed on the market from time to time, but only a few of them have survived. One variety, on account of its bright, golden colored fruit has been a success, and is now quite generally grown.

Varieties of Yellow Raspberries.—Perhaps the best variety of this class is the Gold Coin. This is a yellow variety of good quality for home use. However, it is not quite hardy, and is likely to be winter killed. Still, in favorable seasons it bears quite heavily.

MULCHING.

Mulching as a winter protection is coming to be quite an important factor in the successful culture of small fruits. Mulching is necessary in order to obtain best results. For red raspberries, the best material for mulching is clean wheat straw, or other material free from objectionable seeds. For mulching red raspberries, the grower is strongly advised to not make use of old hay as a mulch as this will be certain to contain seeds of weeds and grass, and these have a tendency to gain a foothold and thrive better among the red raspberries than in the black-cap plantations. Red raspberries should be mulched liberally from both sides of the row. Between the hills in the rows it is advised to scatter leaf mould with well decomposed manure or other good fertilizing material. The main straw mulch should cover all the middles between the rows

of plants while the compost or leaf mould should occupy the space between the hills.

The black-cap raspberries should be mulched sparingly. This is on account of the fact that the young rooted tips will be smothered.

An excellent way to maintain and invigorate a raspberry plantation and keep the plants in good condition, is to fertilize the ground in the fall before mulching. One of the best fertilizers to use at this time is leaf mould from the woods or well rotted compost from the feed lots. In gathering the compost or leaf mould to be used as a fertilizer, the rich soil that lies immediately beneath the materials will be very good to mix in. These materials are splendid for renovating soils, and their effect will be noticeable during the first season from the increased yields of fruit. Summer mulching is quite expensive if practiced on a large scale. Also, summer mulching may be harmful if there is prolonged wet weather. The mulching creates a moist condition at the ground which favors the occurrence of rust and other diseases during wet season. Ordinarily cultivation in the summer should be so frequent as to produce a good dust mulch about the plants and between the rows.

Mulching the ground in the winter after it has frozen hard does not always insure a certain crop. Of course, if frozen ground is mulched, the frost will be somewhat later in going out in the spring. This ought to retard the early growth of the plants and thus enable them to escape the late spring frosts. Sometimes, however, despite the mulch, growth starts early, and a month or so later there is likely to be frost injury. In our locality, mulching late in November or early in December without regard to whether winter has appeared, or the ground has frozen, has proven to be satisfactory.

Berry Novelties.—Of late years, a great deal is heard about varieties of raspberries that are said to bear fruit throughout the entire season. Some have undoubtedly possessed qualities of this kind in slight measure. With us, the ever-bearing sorts have not done well. The strawberry-raspberry has made a pretty fair growth, but is fit only for ornamental purposes. The Himalaya blackberry, which comes to us from California, will succeed in our locality, and the Rocky Mountain cherry bushes are full of life and will probably bear here next season.

Effects of Winter of 1910-11.—The red raspberries, King, Cuthbert, Brilliant, Ruby, Superlative, Herbert, Iowa and Gold Coin, were all killed to the ground. Immaculate and Crimson Beauty, as well as the old Turner, came through safely. The Immaculate stands at the head of the list for hardiness. Strangely enough the Eaton was not hurt this winter, but despite its fine fruit, that variety is of no value here, as it yields only occasionally and makes only a very few suckers.

The Cardinal looks very fine this spring, and I expect from them a heavy crop of fruit. I have entirely discarded the Haymaker on account of its being too tender here.

The black-caps, Cumberland and Munger, are well loaded with fruit as usual. The Hoosier is a small black-cap with us, and not worth planting.

THE GRAPE, ITS ORIGIN AND VARIETIES.

(By H. Theime, Springfield, Mo.)

The grape, the longest known, the earliest cultivated of all fruits. When and where did it originate? What hands gathered its first luscious berries? Who can tell? Long before research folded back the curtains of time, the clusters of the grape ripened under sunny skies. The Bible itself tells us how, after the flood, Noah planted a vine, which according to legend, was a gift from God himself. Perhaps the first plant noticed in North America, even before Columbus and before the Pilgrims, was the grape vine. As California in the west, so does Ohio, New York and Michigan in the east, and parts of Texas and Arkansas in the south, seem to possess the best localities for grape culture on a large scale; but lately a locality has been found in the southeastern section of Missouri, which promises to surpass most others east of the Rocky Mountains, combining most advantageous atmospheric condition, altitude and the grape soil. The Ozark Mountains, which are not mountains, but mostly high rolling table lands, reaching an altitude of 1,500 feet, being above the heavy, muggy atmosphere prevailing over the great Mississippi basin, and thereby indicating a comparative freedom from rot and mildew, the great drawback of grape culture. There are only a few countries where the grape will, in favorable seasons, grow to perfection and there is no country in the world where all kinds of grapes would succeed.

There are over 500 varieties of grapes cultivated in America; yet the number of kinds especially adapted to the different localities is very limited, for each of them, and we seldom find more than three or four varieties forming the main bulk of the vineyards of the different sections. For Missouri, I would recommend the Moore's Early, Worden and Concord for blacks; Niagara, Moore's Diamond and Green Mountain for white; Woodruff red and Deleware, for red.

All grapes eaten fresh make an appeal to three senses; sight, taste and smell. Every cluster has in some degree beauty of form and color, delicacy of fragrance and excellence of flavor or taste.

There are five clearly marked shades of color; black as in Moore's Early, Concord and Worden; clear bright red as in Lindley, Wyoming and Deleware; light creamy white as in Martha, or a more golden tinge as in Pocklington; dark red as in Catawba, Brighton and Diana and a greenish white as in Niagara.

Coming up now to a higher point—the supreme test of a really good grape—the taste—we find a wide range and because some people reject what gives pleasure to others there arises more difficulty in reaching and agreeing upon a fixed standard.

Foxiness as an Injurious Quality.—Nearly all judges will agree that high quality is largely in proportion to the absence of foxiness.

Concord as a whole is unsurpassed and in many respects unequaled by any competing variety, yet, judged by taste alone, is, owing to foxiness, only second class.

The Pocklington is a variety of surpassing beauty and a grape to attract attention on an exhibition table of one hundred varietes, yet its rank foxiness will hardly allow it even second place. Singular as it may seem, some people make it first choice, but they are rare.

What variety of grapes shall I plant? If the main commercial crop is the Concord, it is a good thing to have a few vines of a dozen other varieties. Soils in closely adjoining sections often vary so much that what may not do well on your neighbor's farm, may be a success with you.

While varieties are in a general way, classified as table grapes or as wine grapes, it is true that wine can be made from our best table grapes, and the Vinifera wine and raisin grapes of California are good for the table.

Up to this point of grape development in America, the Concord is the unquestionable leader and most popular American table grape.

THE PECAN.

(By C. A. Reed, Special Agent in Nut Culture Investigations, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C.)

(Note.—The article which follows, is a circular letter prepared by Mr. Reed for answering general inquiries on the subject of pecans. In a short time, a Farmers' Bulletin will be issued by the U. S. Department of Agriculture covering all of this information, and a great deal more. Mr. Reed will be glad to see to it that anyone interested receives a copy of his forthcoming bulletins. Write him if interested.—Secretary.)

Botany.—The pecan is a species of nut-bearing tree belonging to the botanical order, Juglandaceae, which includes also the walnuts, butternuts and hickories. The tree has been known under various botanical names, the most common of these being Juglan's pecan.

Native Range.—The pecan is wholly an American species, being native only to parts of the United States and Mexico. In this country, its natural range extends over a broad area beginning in the southwest with a large portion of central and eastern Texas, and extending in a northeasterly direction to the lowlands bordering upon the rivers of southern Iowa, Illinois and Indiana. The eastern boundary of this area is marked by an irregular line extending southward across central Kentucky and Tennessee to near the northern border of Alabama, thence in a westerly course to central northern Mississippi, southwest to southern central Louisiana, and then along the border of the Gulf of Mexico, west and south across lower Texas into Mexico, but nowhere reaching the coast. In a line nearly parallel to that of the eastern border, the western boundary extends from southwestern Iowa across eastern Kansas, western Oklahoma and Texas to Mexico.

Production of Native Nuts.—Although the territory of native range within the State of Texas is small in comparison with the whole area, it is estimated that approximately 95 per cent of the pecans in the American markets come from that state.

Importations.—The importation of pecans into the United States is of comparatively little importance; Mexico being the only country from which the nuts are received.

Consumption, Markets and Exportation.—Home consumption of pecans has increased during recent years far in excess of the rate of production. Prices have risen correspondingly so that the grower receives from one and one-half to three times the amount paid eight or ten years ago. Foreign markets for this product are almost wholly undeveloped.

Pecan Planting.—The planting and development of the pecan has received much less attention in states where it is abundant as a forest tree than has been the case in neighboring states of equal latitude and similar climatic conditions. Orchard planting and development of improved varieties has been mainly confined to the Eastern Gulf states. There is little evidence that pecan planting attained any degree of importance prior to 1890. During the period approximately covered by the next ten years, numerous orchards were planted from nuts carried to the Eastern Gulf and South Atlantic states from Texas and Louisiana.

Seedling Trees.—It was found that the pecan trees grown from nuts, no matter how carefully selected, did not come true to seed. Many thousand seedlings have since been observed, but up to the present time not a single authentic instance has been reported in which a seedling was identical with its parent or with any of its sister seedlings. The

variations are often most striking. It is now known that seeds from a single tree frequently result in wide extremes of size, color or other characteristics.

Named Varieties.—With the dissatisfaction resulting from seedling trees began the matter of asexual methods of propagation. Scions from trees of known records as to bearing habit, quality of nuts and such other characteristics as might be noted, were grafted upon stocks of other trees. The sorts so propagated were given permanent names and established as varieties. During the years following, several hundred such varieties became fixed in this manner. Many of these, however, have since been found to be of little value, while others are still of recognized merit.

Requisites of a Good Variety.—Experience shows that the number of essential characteristics thought necessary to constitute a good variety constantly increases, and that these characteristics change materially in relative importance to each other. At the present time, it is generally conceded that to be desirable, a variety must at least be fairly resistant to fungus disease, as well as prolific and regular in bearing; the nuts must be easy to crack, not below medium size; the kernel sweet and plump, and readily extracted from the shell in unbroken halves.

Varieties for Planting.—While the matter of varieties is still much in doubt, experience has now reached a point warranting the following general statements:

1. Ordinarily, varieties do not readily adapt themselves to soil and climatic conditions differing widely from those common to their place of origin.

2. When taken to the more humid climate of the eastern states, the majority of varieties having originated in the semi-arid portions of Texas have thus far shown a very marked degree of susceptibility to a fungus disease known as pecan scab.

3. Reports thus far do not justify the planting of eastern varieties in the dry sections of the western states other than to an experimental extent. (It is not improbable that this statemen will be largely disproven when irrigation becomes a common practice.)

4. Varieties of southern origin do not readily adapt themselves to northern planting.

5. Too great precaution can hardly be taken in the matter of selecting varieties, as little subject to pecan scab as it is possible to procure.

In explanation of note 4, it might be added that an effort is being made by parties in the northern range of pecans, chiefly in Indiana and

Virginia to develop varieties native to that latitude which will compare favorably with the best southern sorts. A variety from Indiana bearing the name of that state is already being put upon the market. No grafted or budded trees of this variety are yet in bearing. From Virginia, two varieties, Mantura and Appomattox, are now attracting considerable attention. A few trees of the former are beginning to bear, and have thus far come up to expectations regarding its general merit. Little can be said concerning Indiana and Appomattox other than that nuts from the present trees make a good appearance and with Mantura, they should be given a careful trial in northern planting until more suitable varieties are found.

Regarding the reference to pecan scab in note 5: It should be explained that at the present time this is undoubtedly the most serious of natural enemies to the pecan. Certain varieties are so subject to this fungus disease that in extreme cases they not only fail to produce a crop, but each tree of the affected varieties, in addition to being worthless in itself, is a source of infection to other trees in close proximity.

Range of Cultivated Pecans.—As already stated, the bulk of pecan planting has been mainly done to the east of the area included in its native range. The planting of named varieties has extended over a large section confined mainly to the coastal regions of the Eastern Gulf and South Atlantic States as far northward as southeastern Virginia. Important exceptions to this lie in the facts that large orchards are not uncommon considerably farther inland in most of those states, and that pecan trees have been rarely planted south of Central Florida.

Soil and Moisture Requirements.—Judging from the condition under which the pecan is native and from the still limited experience with planted orchards, this species thrives best in deep fertile soils where an abundance of moisture, either in the way of rainfall or proximity to the water table below the surface may be obtained. Although an occasional overflow lasting for several days apparently does no harm, the pecan is not an aquatic species, ordinarily being intolerant of standing water. Neither is it a hillside tree; it should not be planted where an ample supply of water cannot be assured.

While in the light of present experience the above conditions are supposed to be most nearly ideal, it does not follow that pecan planting under conditions less favorable is not advisable. In fact, it is fairly well established that the pecan can be made to live and bear even under conditions commonly supposed to be quite adverse.

Locality Conditions.—Frequent inquiries are made regarding the advisability of planting in a given state, or of the advantages of one part of a state over those of another portion of the same state.

In answer to these inquiries it may be stated that experience thus far has reached the state where an accurate answer can be given. No man is in a position to prove that here or there is the ideal location for pecans. Many an orchard is just reaching the bearing age; to all appearances its trees are healthy and promising; they may prove satisfactory or a new fungus disease may appear; dry weather, a hail storm, a late frost or some other unforseen condition may arise to destroy the crop for a series of years in any locality.

Bearing Ages.—There are very few planted pecan orchards old enough to have attained full bearing, and consequently there are few data regarding yields per tree or per acre at any age under orchard conditions. A fair comparison of the advantages of different localities, is therefore difficult if not impracticable. Statements regarding yields and suitability of localities under present conditions are necessarily based upon the records of single trees here and there, which generally prove to have been made under conditions more favorable than is at all possible to attain over an entire orchard. Certain varieties often display a remarkable tendency towards early development of fruit. However, three or four nuts at the end of the second or third season cannot be counted as being a crop. Acting upon the policy, advocated above, of not judging without experence, it would be inconsistent to make general predictions; but, with the knowledge in hand that the pecan is normally a large tree, living to a great age, it seems safe to deduce that it should not be at its best until size of body and top, together with roothold, proportionate to its ultimate adult condition shall have been attained. It is but natural to expect that a hastening of life processes of the tree by inducing early fruitfulness in advance of the proportionate growth of the tree will result in certain detrimental effects in later years. Some of the most experienced growers are now acting upon this theory and are not attempting to induce fruiting under eight or ten years from the time of planting.

Prices of Improved Pecans.—Prices for pecans of named varieties have not as yet reached a normal basis. The demand created by nurserymen for use as samples, by fancy confectioners and occasional seedmen has been entirely out of proportion to the supply. Such nuts seldom reach the general market, being sold largely through the channels mentioned above, and by private mail orders, directly from the producer to the consumer.

Cultivation.—In order to attain the highest degree of satisfaction possible, pecan orchards must be given the same amount of cultivation accorded to orchards of other fruits. Special precaution must be taken to prevent the roots of the young trees from becoming dry from the time

of being taken from the nursery till they are well established in their permanent orchard position.

The distance for planting tends to become greater as experience increases. Thirty or forty feet each way was at one time considered to be sufficient. In Southwestern Georgia, a distance of forty-six feet and eight inches each way or twenty trees per acre, was thought sufficient five years ago. At the present time the prevailing distance is from fifty to sixty feet apart. In parts of Louisiana one hundred feet is thought to be more nearly the proper distance.

Planting is usually done in the winter months from January to early March. During the early years of the orchard, inter crops, such as corn, cotton and the like are generally grown between the trees; but great precaution should be taken not to allow such crops to draw upon the soil to such extent as to be detrimental to the pecan trees. Soiling crops, such as cowpeas, velvet beans, or other legumes, are frequently used to replenish impoverished or worn out soils.

Propagation.—For the inexperienced man it is generally more satisfactory to purchase young trees from a reliable nursery. Oftentimes, however, it is desirable to transform the tops of barren trees or seedlings of doubtful value to named varieties. When impossible to secure the services of a practical operator, this may be accomplished either by grafting during the extreme early part of the growing season or by budding in midseason.

The ordinary cleft graft or some modification of it is the method commonly used if grafting is employed. If the trees are to be budded, the tops should be partially removed late in the dormant season and the buds inserted upon the subsequent new growth. The patch bud is the method now in most common practice, where budding is in vogue.

Stocks Other Than Pecans.—Being closely related to the hickory, the pecan readily adapts itself to grafting upon such stock. Although practiced for some time, this operation is still largely experimental. The pecan makes a ready growth upon hickory stocks, but the bearing qualities of such trees have not yet been established.

PECAN GROWING IN MISSOURI.

(Note.—The correspondentce which follows, will supply some information, at least, as to whether it is possible to grow pecans in Missouri.—Secretary.)

Columbia, Mo., May 16, 1911.

Mr. C. A. Reed, Bureau of Plant Industry, Washington, D. C.:

Dear Sir.—For many years I have been especially interested in the subject of nut culture in Missouri. The extreme southeastern counties of this State are very similar to Georgia in both climate and soil. As

you probably know, there is quite a region of lowlands there along the Mississippi where cotton and melons of different kinds are the principal crops. Some of the soil is sandy, while much of it consists of a deep, black, fertile loam. It has occurred to me that some of the better varieties of southern pecans would thrive there. I have heard Professor Van Deman and others say that the southern pecan will thrive wherever cotton grows well. Outside of the lowlands mentioned, I am sure our climate would be too severe to grow anything but the more hardy improved seedlings.

Since I have a great many inquiries from prospective settlers, new comers to Missouri and others, about the possibilities of growing pecans here, I wish you would kindly give me your opinion on the subject. I should particularly like to know what varieties you believe would succeed in any part of this State, and if you can possibly do so, I should also like to know where such varieties may be purchased. Yours very truly,

W. L. HOWARD.

Washington, D. C., May 25, 1911.

Prof. W. L. Howard, University of Missouri, Columbia, Mo.:

Dear Sir.—I am very much interested in your favor of the 16th inst., relative to the test of pecan varieties in the southeastern part of your State. I fully agree with you in the belief that certain varieties, in especially favored localities such as you describe, would be well worth testing at the least. There is little reason, however, to believe that the southern varieties would be able to withstand the climatic conditions of Missouri. If any are to be tried we would suggest that Stuart, Moneymaker, James, Claremont and Van Deman as those which in the light of present information would be most likely to succeed. Of the northern sorts there is reason to believe that the Indiana, Mantura and Appomattox would be more likely to adapt themselves to local conditions. These trees, however, should be grafted to northern stocks and not to southern seedlings. I suspect that trees of these varieties upon northern roots might be obtained from Mr. W. N. Roper of Petersburg, Virginia, and the Indiana and several more recently introduced, can be had in small numbers from Mr. T. P. Littlepage of Booneville, Indiana, at the end of the present growing season. Mr. Littlepage has approximately 2,000 trees grafted this spring, and it is probable that a few will be ready for transplanting at the end of the present growing season.

We should be very glad to see the pecan industry developed in your state, and especially glad to assist you in any way possible at any time. Yours very truly,

C. A. REED, Special Agent.

NUT GROWING IN THE NORTH.

(By H. E. Van Deman, Washington, D. C.)

From the earliest times nuts have been known as a source of human food. The aborigines of this and other countries have always used them because they were one of the natural products of the soil, are rich in oil and other elements of food, are wholesome, nourishing and pleasing to the taste. The cocoanut and other nuts that are borne by various tropical palm trees enter largely into the commerce and food supply of the world. The temperate zones also furnish many species of nuts, and North America is by no means behind in this respect. But until within recent years there has been little done in the way of cultivating any of the native or foreign species, except in California, where the almond and European walnut have been extensively planted for many years past. Now the eastern states are awakening on this subject, and both north and south.

The Pecan.—For many years past the pecan has been attracting great attention, and it is the best nut in all the world, but it is adapted almost entirely to the southern states. That is its principal native home, although there are wild pecan trees as far north as southern Iowa. Some of the most gigantic pecan trees that exist are in the Wabash and Ohio river bottoms in Southern Indiana. But the nuts of nearly all the northern pecan trees are small when compared with the choice varieties of the Gulf states, and their shells are usually thick and the kernels mixed with bitter material. However, there are a few varieties of the northern type that have thin shells and rich plump meats that come out clean and easily. These are being brought to light slowly, and in time we hope to have a list of named varieties worthy of being planted. By growing seedlings from the best of the wild varieties others of excellence may be produced, and more reasonably so if crossing with the large southern varieties is practiced. This will surely be done by some one soon.

VARIETIES.

For the present I know of but four varieties that have been named and their propagation begun that are likely to prove valuable in the north. Two of them are from Virginia, the Mantura and Appomattox, and these are probably not so hardy as the other two because they are of the more tender southern type. Indiana is from the southern part of the State from which it gets its name, and is quite hardy. The other variety is the Starkdale, originated in Missouri. Trees of these two kinds are not ready for sale as yet. To plant seedlings is too uncertain

of good results to justify the trouble. This has been tried many times with the southern pecans, and with great disappointment in almost every case.

THE SHELLBARK HICKORIES.

Although the pecan is the most important and best species of the hickory genus, some of the others are almost equal to it. The best one of these is known as the Little Shellbark. It grows naturally from the New England States to Minnesota and Missouri, but is most abundant from Pennsylvania to Illinois. In the forest the tree grows large and tall, with a slender trunk and long shaggy bark, but in the open it makes a full, round head above a low, stout trunk.

All of the hickories make beautiful shade trees, with their luxuriant foliage and spreading tops. There are great differences in the size, shape, thickness of shell and flavor of the nuts of the species we are now considering, and in the bearing of the trees as well. Almost any country boy knows this full well, and just where to go to get the best nuts and the most of them in the frosty days of autumn. So far there has been almost nothing done towards marking, naming and propagating from the choice varieties that are scattered about the country. Some of them are so valuable for their nuts that it is highly important that they should be saved and distributed over the country as grafted trees or their scions or buds set into others that may thus be made to yield far more valuable returns. A little has been done in this direction, and we have a few named varieties of very fine character of tree and nut. These few are as much superior to the ordinary run of the wild varieties as our best apples are better than the fence-corner seedlings.

Dr. Robert T. Morris, one of the greatest surgeons of New York City, has devoted a large part of his time, thought and money, outside of his profession, for some years past, to the collecting and culture of the choice hickory nuts, along with other hardy species of nuts, and we may look for something very useful to come from this work. Before Dr. Morris began investigating this subject there were several good varieties of the Little Shellbark hickory known, among which are the Hales and Weiker. A very few grafted trees of each of these varieties have been grown, but owing to the extreme difficulty in getting the grafts or buds to take on the stocks, their propagation by nurserymen is not now carried on, so far as I know, nor do I know of any other choice variety of hickory nut being so propagated. However, their great value and the demand for the trees will lead to their production and sale; and as greater skill in the art of budding and grafting nut trees is acquired it is probable that their cost will be reduced.

There are many waste patches, corners or little fields on some farms that might be planted to the choice hickories. Even if the land is rough and cannot be easily cultivated the trees will grow on it very well, provided it is rich enough and the trees are deeply mulched with old trash to keep down other growth until they are well established. As roadside or avenue trees there are few trees more fitting than the hickory. Added to their beautiful foliage and comfortable shade in summer time is the wealth of nuts in the fall. Let the hickories be planted.

FIFTY-FIRST ANNUAL MEETING

OF THE

Missouri State Horticultural Society

HELD AT

Springfield, Mo., December 8 and 9, 1908.

HORTICULTURE IN THE RURAL SCHOOLS.

(By Prof. J. R. Roberts, County Superintendent of Schools, Springfield, Mo.)

The term *horticulture* is of Latin origin, coming from *hortus,* a garden, and *cultura,* cultivation. It meant, therefore, originally, the cultivation of a garden.

It was the pride of a Roman gentleman to possess a garden. Little was thought of its possession beyond the pleasure to be derived from its flowers, its shades, its delicious fruits and its fountains. Time and necessity have widened the confines of the garden, until horticulture has come to possess a meaning difficult of differentiation from that of agriculture itself. In other words, the "*garden*" has widened into a "field;" the small fruits, the table vegetables and the like have climbed the fence and are keeping company with the cereals, the provender and the apples.

The *pleasure* of the garden has been lost in the strugggle of its products to find commercial precedence and adequate financial returns. We are now approaching, perhaps, the happy *aureum modicum* of these two extremes by seeking to obtain both pleasure and profit from horticultural study and practice. When we can get profit out of our pleasure, we shall likewise be able to get pleasure out of our profits.

For that class of people who will bring about this desirable combination we must look almost wholly to the rural population. The reason is self-evident. The boys of the city will continue to think in the lines of industry pursued by their fathers, and hence become lawyers, physicians, merchants, artisans or idlers; the girls will similarly fall into the plans of their mothers, and none of the city's population will ever make much advancement in horticultural or agricultural pursuits until, after growing old and becoming weary of the humdrum of the office or

store or shop, they seek solace and repose in rural life, and cultivate the soil for the *pleasure* found therein. This class, I grant you, has contributed much to horticultural advancement, but their contributions come too late in life to contain the value that would have come from a study and practice begun in youth.

Out on the farm the boy and girl have an excellent opportunity to subject theory to rigid practice. There are enough waste places on the farm, if the father will furnish no other ground, to supply the boy with all the "experimental stations" he may desire. The barn and henhouse fertilizers are at his command, and even the ruder utensils of the farm will suffice him until the farmer's interest is sufficiently aroused to cause him to furnish the boy with the necessary tools.

What a splendid chance for the boy on the farm to watch for results! At the age of 8 he plants an apple tree; at 12 he begins to "sample" its fruit; while at 15 or 16 he gathers and markets a full crop, enjoying frequent repetitions of these delightful ingatherings until the time comes for him to make a home of his own, and with joy at the remaining vigor of the trees of his own planting, he turns them over to those who yet linger at the old homestead. Theory? Not a bit of it!

But before horticulture can make a very strong appeal to the average boy or girl in the country, it must become a study. Strange, that in a country where there is so much depending upon an intelligent mastery of the soil, so little has been done to train the rural citizen in the matter of making the soil most responsive to the demands, both of pleasure and of profit.

O, we have had for years in the schools a something we call "Nature Study," and a "something" is about its best interpretation. One teacher is giving lessons in Nature Study, if she has a class in physiology; another measures up to the requirements if she has the children writing and talking about leaves or birds or insects. In short, the subject of Nature Study is so broad that it narrows down to almost nothing at all, and naturally, the teacher, with so broad a subject before her, "Scatters her forces," and in trying to know a little about everything, comes into possession of no very valuable knowledge about anything.

Clearly, then, before we can do very much towards putting the study of horticulture in the schools, there must be such trimming down of "Nature Study" as to make it mean agriculture or horticulture, or both, if neither word is to be made to express the idea contained in the other.

We cannot hope to advance very rapidly in this matter until we become more exacting in our demands upon the teacher's qualifications.

There will be no horticulture in the rural school until there is a knowledge of horticulture in the rural teacher. I have been saying for years that if I had my way about it, no one would be permitted to teach in a rural school who was not thoroughly competent to give instruction in those subjects calculated to inspire a love for rural life. I go further; before I would place a teacher in charge of the boys and girls of the farm and orchard, I would know that that teacher was in love with rural life herself.

We ought to have a specific statement of the kind of "Nature Study" we want taught; competence to teach that subject should be required of applicants for certificates, and then school boards and other school officers should see that the teacher does her duty in the matter.

Of course, just now we are embarrassed by a scarcity of competent teachers, both in city and country. The cities give more attention to school houses than to school teachers, while the rural districts are so afraid of a little tax as to neglect both house and teacher. But a better day is dawning. We are coming to understand that economy in providing teachers is the most dangerous sort of economy.

It has long been the understanding that in this country our most substantial citizenship comes from the rural sections. If this be true, then whatever elevates the rural citizen contributes very largely to the elevation of the whole country. This I am saying as a preface to the remark that the best teachers should be in the rural schools, instead of, as is supposed, in the towns and cities.

Enough has now been said to lead up to the main issue, namely, "To what source shall we look for the class of teachers desired?" I am speaking especially of the class of teachers needed to inspire love of rural life, contentment on the homestead, and a desire to intelligently command the resources of farm and garden.

We cannot expect these teachers to come from the high schools as now existing, for these high schools are in the cities, and scarcely touch the "hem of the garment" of rural life. We cannot expect them to come from the colleges, for no college graduate will condescend (?) to teach a rural school. Can we look to the State University—the people's (?) school? Hardly; for though horticulture and agriculture are supposed to be "mastered" at the university, the "masters" of the science seek lucrative positions as remote as possible from the farming population. Our only safe resort is to the State Normal Schools. These schools, in theory always, and for the most part by practice, come in close touch with the district school by coming in close touch with the district teacher. If these State institutions will so arrange the course of study as to

reach the needs of the rural teacher along the lines vital to rural life, they will soon solve the problem for us.

I may be permitted to say here in passing that already the influence of the Fourth District Normal is being felt in the more efficient teaching of the branches of study now taught, and this leads me to believe that if the rural teacher were required to pass examinations in horticulture and agriculture, the State Normal's influence would as readily be felt in that line also.

A text book, written by an expert in horticultural science, and approved by men of practical knowledge of the subject, as well as by teachers competent to judge of its pedagogical merits, is perhaps among the first things to be considered. Such a text must be sufficiently technical to present the necessary nomenclature of the science, and at the same time avoid the unnecessary use of those high sounding terms that stagger the youthful mind and destroy interest in the science itself.

What a field for instruction here! The various classes of plants of garden and orchard; their roots, stems, leaves; the subject of grafting, budding and pruning; the soils, fertilizers, manner of tilling, etc.; insects, birds—helpful and harmful; gathering the crops, preserving fruits and vegetables, the succession of crops—all these things, in the hands of a teacher fairly well versed in them and in love with the subject, will certainly "find the point of interest" in the rural community, and do much towards redeeming the rural school from the tiresome grind to which so many of them are now subjected. Under the principle of what the teacher calls correlation, the subjects of arithmetic, grammar, geography, and so on will all be made to contribute to this the theme of themes for the rural child, and compulsory attendance laws for country districts will have little cause for place on the statute books.

Such a consummation is perhaps a long ways off; but the farther the journey the greater the necessity of beginning as early as possible. This honorable body can do more than any other one organization in the State to bring about the conditions desired. You, above all others, can secure the co-operation of parents and teachers in this matter. That you are already thinking along these important lines is shown by the fact that you are inviting school men to discuss before you, and with you, the various phases of the subjects to be considered. For the kind invitation extended to me I wish to render you the thanks that I am sure will find a ready response from every boy and girl of the rural districts of Greene county.

NATURE STUDY AS APPLIED TO AGRICULTURE.

(By Prof. C. H. Spurgeon, Drury College, Springfield, Mo.)

This is a very large subject and will admit of a number of subdivisions. In my talk today I shall confine myself mostly to plants and animals. The subjects of horticulture and agriculture are subjects of great importance, and we certainly need a campaign of education along these lines. I want you to take home to yourselves what I am going to say to you today. It is the purpose of the Agricultural Department to bring before the people all that is useful and necessary to develop the many things that ought to be done to make the country an ideal place in which to live. And this should be the purpose of all our schools. The tendency has been towards the city of late years. The purpose of education should be to remove the conditions in the country which cause this tendency.

Bacteria are conceded to be plants, and I want to speak of them in this connection for a short time. There are two kinds of bacilli that I want to call your attention to more particularly. They are Typhoid Bacillus and Tuberculosis Baccillus. There was a certain small village located in the distant mountains far from other habitations, and no one had visited this village for many months, and yet an epidemic of typhoid fever broke out in this small place. It came from the water. They went all around the mountain and found a small lake. They put certain salts in this lake and traced them to the spring from which the village got its water supply. There was only one family living near the lake. One son had been away, and, contracting typhoid fever, returned home. The clothes had been washed in the lake, and thus the germs had found their way to the village water supply and spread the disease. I mention this incident to show you the necessity of being very careful about our water supply on the farm as well as in the city.

Tuberculosis is not always confined to the lungs. Seventy-five per cent of all autopsies that have been made have shown the subjects to have been affected with tuberculosis at some time and been cured. Strong persons may overcome an attack and get well. Yet, more die than with any other disease. Unsanitary conditions cause this. We breathe millions of bacteria in the air every day, and the only reason why we survive is because we have sufficient vitality to throw them off. We need better sanitation in the country as well as the city.

We have often heard people say that thunder causes milk to sour. This is not true. The presence of bacteria in the milk causes the milk to sour. The temperature is more suitable for the growth of bacteria

during thunder showers, and hence the impression that thunder causes the milk to sour. Very few dairies produce comparatively pure milk. There is little milk that does not contain from three to five million bacteria to the cubic centimeter. Most of these do no harm, but not always. One dairy near Chicago produces pure milk. Milk shipped from this factory after being seventeen days in transit was opened on the twenty-first day, and was still sweet. It kept well because it was comparatively free from bacteria. We should be more careful about caring for the milk on the farm. This is very important, because typhoid fever is often contracted from impure milk.

The International Congress of Tuberculosis discussed the question as to whether tuberculosis could be transmitted from animals to people. One noted authority held that it could. We are just beginning to learn about these things. There is much to learn yet, on many subjects. The spirit of horticulture and agriculture is permeated with investigation. It was found that clover in Australia would not produce seed; this led to an investigation of the clover plant. They found that the bees that worked on the clover had long sucking tubes, and that they pollenized the clover flower. Bumblebees were introduced into Australia, and they succeeded in growing clover seed there. We used to destroy all the bumblebees we could, not knowing that they were valuable. We should protect them, as they are useful if we grow clover.

We are learning about another thing, and that is wheat rust. For hundreds of years the farmers of Scotland knew by the Barberry leaves that they would have no wheat on certain years. The disease ripens on the Barberry leaves and blows to the wheat where it forms the red rust stage and later forms the black rust stage. We have been able to tell how rust attacks our grain, but there is still room for us to learn more.

We need more intelligence about birds badly. They are very valuable friends to the horticulturist and agriculturist. We should protect the woodpeckers, of which there are five or six common species. The yellow-bellied ones and sap sucker are very valuable. They injure but very few trees. The yellow-hammer is also very popular. They are prominent insect eaters, and the first enemy of the codling moth. We must give children knowledge about birds to interest them. We need teachers who have more knowledge about birds so they can instruct the children along this line. The yellow bill and black bill cuckoos are great insect eaters. Their food consists of 75 to 80 per cent hairy caterpillars. They eat so many of these caterpillars that the hairs pierce the lining of their stomachs. We should protect them by all means. The English cuckoo is a vagabond. It lays its eggs in other birds' nests. The cow birds

do the same thing. They are so despised that even the English sparrow will not associate with them. Crows and jays are brothers. They belong to the same family and have the same kind of bills and feet. Hold the jay up between the eye and the sun and he has no blue. His base color is black. They are in some respects detrimental. They eat a few small birds and destroy a little fruit, but as a whole they are a valuable bird. The crow is a bird that has been able to maintain its numbers while other birds have not. The chief damage that it does is to pull up young corn. It can only eat soft corn. Corn may be protected by scattering soft corn about in the field. The bobwhite is another valuable bird. It will travel over entire neighborhoods, eating many insects not only in spring but in fall and winter as well. Farmers should provide food for them when snow is on the ground. The raptores, hawks, owls, buzzards and eagles are more beneficial than most people give them credit for. Many people think it something great to kill them. Very few of them eat chickens. The horn own eats many mice and reptiles, and is very valuable to the farmers. And many of these birds of prey destroy more mice, rats and other vermin than they do damage. The bee bird eats large numbers of ants. The woodpecker is the only bird that can go beneath the bark of trees and dig out the larva of wood insects. There are many things about birds and other nature subjects that it would be beneficial for the farm boy and girl to know. These things should be taught in the public schools. I hope to see the time when we shall have more practical matter about horticulture and agriculture taught in all our schools and colleges.

AGRICULTURAL COURSE AT STATE NORMAL.

(By Prof. W. T. Carrington, President State Normal School, Springfield, Mo.)

Agricultural knowledge should be required of every teacher. If this was required of them they would be better prepared to teach agriculture. It ought not to be required in our schools until teachers are prepared to teach it, and that will be quite a while yet. We must get interest in this subject before we can do very much along this line. The people in general must become interested and demand that these subjects be taught in our schools. There are those who advocate teaching children more practical knowledge, such as woodworking and other handicraft work so that they will be able to do better work in the shop and other avocations of life. The question is to what extent must we teach agriculture. Shall we study from the scientific standpoint or from the

practical standpoint. I believe that we should teach them something about plant and animal life, and something about the soil. Let the teacher teach something he knows something about and can teach, and then gradually lead up to agricultural education. The boy wants to know how to raise corn and wheat; how to care for the orchard; how to make butter and how to do the practical things on the farm. I don't think it will be so difficult to teach these things. I believe our teachers can soon do this. The thing we want to do in the normal school is to teach the simple things first. I would like to have several acres near the normal to grow different kinds of grains and grasses; experiment in dairying, poultry and farm mechanics. Zoology should be a part of the course. Our hope in Missouri is that we will be able to teach in our schools domestic science—teach the girls how to make good homes. We want to teach handicraft work so the boys can do things on the farm and not have to call in help to do every little odd job. I don't see that there needs to be very much difference in country and city schools. Many boys and girls go from the city to the country and need to know something of farm life. It is just as important that the boy and girl from the city know something about farm life. We don't want too much distinction between town and country life. We need agriculture in all our schools. I would have an agricultural education that would instill a love for the work in their hearts. What we would have in town and country we must put into the normal school. The boys and girls who learn these things in the normal schools, expecting to teach them, will take hold of this work and become interested in it because they know that they must impart this knowledge to others. To what extent we can do this in our normal schools depends on many conditions. Where we can get one good teacher for agriculture we can get forty for history. It will take time to do this. It will take money. Something is being done in Congress along this line, and our State legislators are in sympathy with the movement, and I think we will be able to make much progress in the way of agricultural education within the next few years.

THE COLLEGE AND AGRICULTURE.

(By Dr. Hall of Drury College, Springfield.)

It has been generally believed that the college educates the boy and girl away from the farm. This is true to some extent, but I don't think the college is responsible for it. The whole trend of life of late years has been away from the farm. You will find hundreds of abandoned

farms in the east. The fact that boys and girls who go through college are dissatisfied with the life from which they came only shows that they have grown in knowledge and aspire to the higher ideals of life. If we keep them on the farm we must make farm life more attractive and the country a more ideal place in which to live. Nothing has done more to revolutionize farm life than the introduction of the telephone, free delivery of mails and the interurban railroad. I can remember when I was a boy we lived twenty miles from nowhere. I never saw a railroad car until I was fifteen years old. Farm life had been isolated and lacked attraction. These things I have mentioned have done much to bring farm life up to a level with city life. But things are changing. A short time ago I camped twenty miles from a railroad, yet they charged me Springfield prices for eggs. They got the prices by 'phone every day. These things are changing farm life. In the next quarter of a century things will be reversed and the trend will be towards the country.

Life in the city is a strenous life. The average life in the railroad offices is ten years. These lives must be replenished by the boys and girls who come from the farm. Where did the business men here in the city come from. The farm to be sure. It always has been so and it always will be so. In order to keep city life from going into decay it must be replenished from the country.

This is an age in which we are trying to adjust our education to the demands of the times. If you will look at the courses of study in our colleges you will see that new eras are being incorporated. Yale is adopting new courses according to the demands of the age, and this is true in all other colleges. The trend is from theory to the practical. We hope to have a large farm to use in connection with Drury College sometime. If we had such a farm it would afford many young men a means of putting themselves through college. Not only that, but they would be learning something about scientific agriculture. I believe the college people in general are interested in this problem of agricultural education.

This is an age of industry, but it will be a failure unless we keep hold of the idea that the life of all our industries depend upon the farm and the country boys and girls. We are living in a grand and glorious country, and we only need to learn to see the beauties of nature in all their grandeur. I want to tell you that you can see as glorious a sunset here in the Ozarks as you can see from the square in Venice. We don't need to go abroad to see glorious things. Let us learn to see the beauties that are before us and then we will realize more and more that life in the country is the ideal life.

INSECT ENEMIES OF ORNAMENTALS.

(By Miss Mary E. Murtfeldt, Kirkwood, Mo.)

The two uncertain factors affecting the development of every variety of vegetation are the weather and insects, and of these insects is the most uncertain.

The latter are unquestionably the most omnipresent and adaptive of all forms of animal life. Not only are they found wherever plants grow, but great numbers subsist on dry wood, on manufactured products, and on almost all living animals and animal substances. They occur in innumerable species, from the most minute to the most gigantic forms and from those of superlative beauty to others of repellant aspect, in the tropic heats, and although in comparatively few species, yet of most pestilent character and incalculable numbers amid the glaciers of the arctics, and everywhere they are, with a few exceptions, inimical to the property, the comfort and enjoyment of man and the higher animals. We may not wonder at their prevalence in the dense, primeval forests, and in the comparative security from disturbance of the wide-stretching field and meadow, nor even in the artificial luxuriance of the vineyard, the orchard and vegetable garden, but that they should contest with us the possession of our rose gardens and of the shrubs scattered over our lawns, nay more—that we are not even able to exclude them, nor expel them when once they have gained an entrance, from our greenhouses, conservatories, and the window gardens of our sitting rooms, would almost make it appear that nature herself was in league with them for our discomfort. But even so, we cannot give up the battle, wearying and patience-trying as it is. We must continue to vary our tactics, to search out the enemy's undefended position, to tax our ingenuity in methods for keeping them at bay, in the invention of new sorts of ammunition, and in the multiplication and effectiveness of our weapons of war.

In a consideration of the insect pests of the plants grown for ornament, or as objects of mere curiosity, the subject is so comprehensive that restrictions must be imposed in several directions. First, in the kind of plants affected, which must be limited to the shrubs and garden flowers in common cultivation, and to such plants as are generally grown in conservatories, coldframes and in windows in winter. Again it will be necessary in order to keep this paper within reasonable limits to discuss only the species of insects which very seriously affect the plants in question and which very generally prevail over a wide area of country. Even within these bounds, so numerous are these tiny depredators, that many that are only locally or sporadically destructive must be omitted.

Of all garden, greenhouse, cold pit and window shrubs the rose is "far and away" the most widely cultivated, the most profitable, the most ardently loved and admired, exists in greatest number of varieties, is most constantly in bloom and is, alas, subject to attack from the greatest number of fungous diseases and insect enemies. It is a plant that must be constantly attended and cherished—the product of the highest degree of plant civilization. Nature makes heavy reprisals on all such deviations from typical forms which man must continually be on guard to counteract and combat.

The insect enemies of the rose, though not the same in all countries, nor in all sections of the same country, are almost innumerable in every locality. In some parts of the east and north the Rose Chafer (*Microdactylus spinosus*), which is also a formidable vineyard pest, is almost prohibitive of out-of-door rose culture. This long-legged, slender, cinnamon-brown beetle is represented in the insect fauna of Missouri and contiguous states, but strangely enough, it has never, to my knowledge, appeared with us in the role of a rose pest.

The pre-eminently destructive rose insects in the latitude of St. Louis are the so-called rose slugs—two or three species of saw-fly larvae which prey upon the foliage. One of these, the smooth, dull green species, sometimes called Harris's rose slug (*Monostegia rosae*), has been known almost from the beginning of rose culture in the United States, although it is supposed to be native only to the eastern section. Long ago, however, it was disseminated throughout the country on rooted plants, the small inconspicuous cocoons being concealed in the earth which adhered to the latter. It is not difficult to keep this species in check since it is only single-brooded, the flies emerging late in April and early in May, and placing their eggs here and there in the edges of the leaves between the upper and under cuticles. The slugs hatch in about a week and the majority of them reach their full size at the time the blossoming season is at its height.

A careful study of the habits of this species have shown how to apply the remedies to make them most effective. It feeds only at night or during very cloudy days, and only on the upper surface of the leaves which it does not eat into holes, but merely gnaws the green tissue, leaving the entire net work of veins—skeletonizing them in other words. Now, these facts point to the evening as the proper time to spray the bushes and also indicate the lack of the necessity for making any especial effort to apply the spray to the under sides of the leaves, as must be done to reach so many leaf-eating insects. Another thing which affords the rose grower satisfaction is that these slugs are easily poisoned by a substance

that is not acrid and has but slight poisonous effect on man, or the domestic animals, and does not, in any way, injure the appearance of the bushes. This is the infusion of white hellebore. If fresh, one ounce will make three gallons of the tea of sufficient strength. The easier way to prepare it is to pour over the powder one or two quarts of boiling water, and let it steep for two or three hours and then add sufficient cold water to make three gallons. We have been able to keep this skeletonizing slug in check by the use of this spray—usually two applications with an interval of eight or ten days between, but some seasons only one—for many years, until now it gives us very little trouble.

I regret I must offset this encouraging statement by mentioning that in the meantime, since 1888-90, another insect of the same family has appeared and multiplied in the vicinity of St. Louis, and probably quite generally over the Mississippi Valley, which threatens to be much more difficult to overcome, inasmuch as this species is from two to four brooded in a season according to the latitude. This is the European or Bristly Rose Slug (*Cladius pecticornis*), which was, no doubt, introduced on imported rose plants from France or England. It is about the size of the American species, but is of a brighter green color with the surface covered with branching spines, and when ready to transform, does not burrow into the earth, but incloses itself in a gummy, silken cocoon on the under surface of the leaves or in the axils of twigs—the four-winged fly emerging in about ten days in summer. This does not skeletonize the leaves but eats them into irregular holes, finally devouring all the substance except the principal ribs. It is seldom to be seen on the upper surface, but as it eats entirely through the leaf, may also be poisoned by the hellebora tea, which, however, in combating this species, requires to be applied once in two or three weeks until frost.

The rose has many other insect pests which eat its foliage, gnaw its buds and bore into its stems in common with those of a variety of plants. These vary in destructiveness with different seasons and are not often present in unconquerable numbers. Among these will be found two or three large caterpillars of the cut worm family, some geometers, including the common canker worm, and about a half dozen small, smooth caterpillars, the young of beautiful little moths of the family, *Tootricidae*, so called from the leaf rolling or twisting habits.

In addition to these there has appeared in rose gardens in Kirkwood, and probably in other suburbs of St. Louis, another pest in the form of a small green worm with a narrow dark line down the back, which seems to be exclusively a rose-bud borer. Its work is characteristic and its presence is recognized at a glance by the bent over bud

against which a leaf is partially drawn and a little chamber of gummy silk thus formed within which the hinder part of the body of the larva may be seen while the head and interior joints are buried deep within the base of the bud which it completely excavates. This first attracted my attention last year as something new. Three or four of the borers were found from which, in two or three weeks, was bred a pretty feather-winged moth similar in size and color to the grape vine plume moth, but with the colors quite differently arranged. From the greatly increased numbers observed the present season this promises to become quite a serious pest. The application of poisonous sprays for the purpose of reducing these leaf rollers and bud worms is of but little avail, either in the garden or in the greenhouse, where these insects often do considerable damage also. They can be controlled by making the rounds of the plants once in two or three days and giving a sharp pinch to every twisted or webbed leaf that is observed and cutting off all buds that have indications of insect work, and burning or crushing the latter at once.

Most of our standard shrubs—lilacs, syringas, spireas, japonicas and others are fairly free from insect pests, but the sweet Dutch and our native Coral or Trumpet honeysuckles, both of which bloom from the tips of the shoots, are gradually succumbing to the attacks of an aphis which first came under my notice four or five years ago. It is only the blossom buds or the very tenderest of the young leaves that are attacked, and so persistent and destructive is this pest that well established plants with a height of eight or ten feet and corresponding spread of vines are now reduced to a low, scrubby, distorted growth that renders them anything but ornamental. On account of the close folding of the bracts and leaf buds over them, it is very difficult to bring any insecticide in contact with the aphides, and almost the only way of temporarily re-leaving the plants is to enclose them in some sort of tent, and subject them to severe fumigation of tobacco. We have also had some success by the application of air slacked lime, but this, of course, renders the vines unsightly. The present season has brought some encouragement in the great number of natural enemies that have appeared—principally the larvae of syrphus flies and lady-bird beetles.

Aphides of various species are among the most troublesome pests of greenhouses and conservatories and on violets and pansies in cold-frames. In inclosures, whether large or small, they are kept in check, but never exterminated, by frequent fumigations with tobacco, but this is not altogether salubrious to the plants, and often the most naturally fragrant of roses, carnations and violets will diffuse chiefly the odor of tobacco in the drawing or dining room to which they are brought for decoration.

The use of hydrocyanic acid gas has been proposed by some government entomologists as a substitute for tobacco, and, when the experiment is conducted by an expert, has proved much more effective than the latter. But the use of this deadly poison is fraught with too much danger to human life as well as to the stock to make it advisable to recommend it for general trial.

The principal insect pests of palms and ferns are two or three species of Lecanium or "soft scale," in which the scale is not distinct from the body of the insect, but is a part of it. One of these, *L. hesperidium,* is quite flat, of oblong form, closely oppressed to the leaf or stem of the plant attacked. *L. hemisphericum* is, as its name implies, when fully grown of thick, rounded form and glossy mottled-brown color, often one-eighth of an inch in length and very nearly the same in diameter. *L. olea,* which attacks chiefly woody plants, is about the same size, but is crossed by two ridges which give it something the shape of a saddle. On commelis, azaleas, oleanders, olives and other plants of that character, these scale insects can be kept in check by the use of kerosene emulsion without any very great detriment to the plants, especially if the latter are thoroughly rinsed with clear water soon after, but on palms and ferns there are but two modes of treatment except at the hands of chemical and entomological experts. These are, to remove the scales by hand, by the use of a soft cloth over a skewer or pointed stick, keeping the cloth dampened in strong soap suds or in the case of the young or very small ones, which on account of their size are not easy to see, a soft tooth brush may be used for applying the soap suds.

BEES AND HORTICULTURE.

(By M. E. Darby, State Bee Inspector, Springfield, Mo.)

Bees and horticulture make a delightful combination; rich in nature study; full of practical and scientific research and moral teachings. In their life and habits, their relationship and mutual dependence, the one upon the other, we find a most beautiful and useful lesson in the harmony of nature. One which holds us in wonder and amazement, while we consider the marvelous provision in nature for the accomplishing of good results and the prevention of waste.

Here we find the one getting its food supply from the other out of a product, honey and pollen, that would otherwise be wasted; and while so doing is unwittingly performing a service that means the perpetuation of the species of the other. Hence we find that the profusion of nectar

bearing flowers, which are so generously produced all over the country, in cultivated orchards, fields, pastures and gardens, to be absolutely necessary for the well being of the bees. While on the other hand the bees and other insects are a necessity to the fertilization of the flowers and the production of seed for the perpetuation of their kind.

To enable the uninformed to better understand this relationship, let us briefly notice the construction of the flower; the arrangement of its parts, the functions performed, then the means for its pollination, and the special adaption of the honey bee to this work.

The flower, which is but a special development of leaf growth, is peculiarly arranged in itself for some special purpose, and these modified leaves are converted into special parts or organs to accomplish this prearranged purpose, viz.: reproduction. For this end, these modified members are developed into two sets of organs, beautifully and systematically arranged. First, the outer or floral envelope, consisting of the calyx and corolla, which serve for protection and attraction; second, the inner or essential organs, consisting of the stamens and pistils. The functions that these perform bear a true resemblance to sex in the animal kingdom. The stamens, or male organs, the anthers of which are the principal parts; these contain the pollen grains or fertilizing element. When the anthers are ripe they burst open, and the pollen grains are ready to be transformed to the receptive surface of the stigma.

The pistils or female organs consists of the ovary or seed receptacle containing the ovules, the style and stigma. The stigma is the upper portion of the pistil, which when ripe presents a viscid surface which receives the fertilizing element from the stamens. These essential organs may be contained in the same flower, or they may be in different flowers, and on different plants or trees.

In most plants there is a prepotency to foreign pollen; other flowers are absolutely sterile to their own pollen; in others the essential organs come to maturity at separate times; still others have the stamens in one flower and the pistils in another, thus showing a wise provision in nature to prevent self-fertilization. Here we see the wisdom in the forces back of nature in providing the tempting sweets to entice insect visitors. Darwin summed this subject up by saying: "Nature abhors perpetual self-fertilization."

To accomplish perfect pollination of the flowers, so that a generous crop of seed or fruit may be secured, some animate or inanimate agencies must largely be depended upon to perform this service. In some plants and trees the pollen is of a dry or powdery nature, and produced in great abundance, so that the wind or inanimate agency does the important

work. But in many cultivated fruits the pollen produced is more of a sticky nature, and not produced so abundantly, and not so easily carried by the wind, making it necessary for some animate agencies, such as bees and other insects, to perform the greater part of this service.

To induce insects to visit the flowers and perform this service, Nature placed a tiny drop of nectar, which is suitable for insect food, in the bottom of the flower in such a manner that to obtain it the insect must come in contact with the essential organs as it goes from flower to flower getting its food. Here the bees render a very valuable service to mankind as pollen distributors. A service that we do not appreciate as we should for the reason of our inability to measure the exact amount of service rendered, and further, there are no established wages for a bee's day's work, whether it be organized or unorganized labor. Yet the bee knows full well what reward it will get or what the penalty will be if it "knocks off" and goes on a strike, while the golden grain of pollen and silver drops of nectar are evaporating and wasting in a field that will be fruitless.

The bee is specially adapted to the work of distributing pollen, by being provided with a long flexible tongue for lapping up the tempting sweets secreted in the nectaries of the flowers; its hind legs are provided with a pair of pollen baskets, in which it carries great pellets of pollen to its hive, to be used in the preparation of food for the larval bees; its body is covered with a number of fine hairs or bristles, which gather the pollen grains as the bee goes from flower to flower in search of pollen and honey.

While the bee is busy in gathering its precious loads to carry home to its hive, it is incidentally carrying the ripe pollen grains from one flower to another and brushing them on the receptive stigma; thus performing an act, as it were, of touching the button and sending the current of life down into the baby fruits, fertilizing the ovules, and causing the development of seed and fruit. Improper pollination results in a failure of fruit to set or in its dropping before ripening. It has been asserted by those who have made the subject a careful study that the work done by bees in pollen distribution is worth more to humanity than the crop of honey produced.

A majority of our finest fruits are evidences of the bees' good work. A large number of them have come as chance seedlings, being a product of varieties then existing, mixed in the bloom by the bees; the ripened seeds thus produced being dropped in some out of the way place where it germinated and grew, having its struggles for life and sustenance, until its beautiful, tempting fruit brought it into favor with man. It was

then cultivated with care, and new plants started from it by some system of propagation such as budding, grafting, layering or cuttings, whereby this valuable fruit may be reproduced with certainty and be of use to man. It is sometimes very difficult to trace up these valuable chance seedlings, and place the credit for their existence where it properly belongs, and it should be mentioned here, and we do it with pleasure, that all the new and valuable varieties of fruits, vegetables and flowers are not the product of wind and insects.

While nature may seem slow and somewhat reluctant in divulging her secrets, yet to him who has proven himself worthy by years of patient toil, much thought and careful investigation, she delivers the keys that unlock her hidden forces. Yet we have a few horticultural giants, such as Bailey, Burbank and others who have gotten close enough to the heart of nature to obtain that key which has enabled them to accomplish such great good all along the line of horticulture. Many new and choice fruits, vegetables and flowers are the products of their skillful hands. When these new productions are propagated in sufficient numbers, and set in commercial orchards, we find the majority of them require the visits of the bee to brush life into their baby fruits, just the same as others. So man with all his boastful pretentions in controlling the lower forces of nature, would make a dismal failure in producing the abundant crops of fine fruit that supply the markets of the world, without the help of the industrious honey bee.

It is sometimes said that nature makes no mistakes. Yet freaks are no uncommon occurrence. Sometimes we find coupled on a man's shoulders a donkey's head, exhibiting all those stubborn, kicking and self-willed dispositions of the real animal. A very good illustration of this character is that of a man who repeatedly persists in spraying during fruit bloom, killing his friends, the bees, and injuring the bloom by poisoning the tender organs of the flower. Efforts to convince him of his error are in vain. He is at variance with the world, sadly out of harmony with himself, and you are forced to the conclusion that to "convince him against his will he'll be a mule still."

A great many horticulturists are not beekeepers, yet they should take that honest pride in helping to keep their neighbors' bees that is characteristic of the intelligent and liberal minded man who knows when he has been benefited, and is still willing to acknowledge the favor. This seems easy enough in the blooming springtime, when all animated nature is in tune with the Creator; when the very air that surrounds us seems to be laden with perfumed poetry, set to notes almost divine; and everybody loves his neighbor. However, when the latter part of the summer

arrives, if there should be a scarcity of honey producing flowers, the bees' shortcomings are manifested, then, how soon the whole scene, stage and all, seem to tumble upside down, and a rehearsal of prose, very common every day prose, mingled here and there with ugly nerve grating epithets, may be heard, not in the orchard, at the cider press and even in the kitchen around the preserve kettles and jelly pans.

Bees, like the human being, are not without faults, and when the fruit harvest comes on they, like men, will go to collect a part of the crop that they have helped to produce. They, however, take the rotting, cut, punctured or bruised; the very culls of the crop. While man takes the very best and then is not satisfied, he wants to cheat somebody by placing those culls in the middle of his boxes and barrels. Bees do not lead in the ugly work of puncturing sound fruit as many people believe. Their mouth parts are made for working wax, and not for cutting and puncturing; but they will quickly engage in the work of carrying off the spoils, when the skin is once broken or cracked, as it often is from a sudden flow of sap, or when punctured by birds, yellow jackets, wasps, curculio and other insect pests, or by fungus growth which causes rot, which is so often noticed in peaches, in which case the broken down tissue presents such a slight change at first that it is unobserved by the fruit grower until the bees, who are close observers, have detected it, and are at work trying to save that which would go to waste. Then the fruit grower comes in and says: "The bees are doing it; I saw them do it, you can't fool me!" He might with equal propriety say that the common old everyday buzzards were directly responsible for the death of some fine animal that he lost, because he found them feasting on its dead carcass.

These fruit juices are decidedly harmful to the bees; but here, again, we find them acting like some people, imbibing too freely of that which does them hurt. But men do not wait for drouth or famine to cause them to hunt for the tempting juices of peach and grape. It is in time of scarcity and under the above named conditions that the bees swarm to our fruits, cider presses and kitchens, and we trying to follow out the principles of the Golden Rule in the relations with our beekeeping neighbor, we learn then how much easier it is to be a bear than it is to forbear.

On such occasions we should learn to use the memory of service rendered as oil for the rusty machinery of patience. Yet many people will spend much more time in grumbling and growling about some slight loss of those worthless culls, and a few accidental stings received, then they will in thankfulness for benefits measured to them in the half bushel.

Some people will magnify a bee sting until it seems greater than a

railroad accident, and still seem to be unmindful of their own cruel words and unkind actions, which may be stings of much longer duration to some neighbor or friend.

If the world would pay half the attention to the human stings that are inflicted along the highway of life in the wild delirious scramble for wealth, position and power that some people pay to an occasional bee sting, what an uplift society could receive.

The colony inside the hive, again like human society, often maintains a large number of drones, who live by the toil of others; but toward the approach of cold weather the society of the hive kills or drives out its drones; while human society increases the number and gives them increased privileges. If the workers or producers in human society should deal thus with their drones, and public leeches, there would be an exodus to tropical climes the like of which has never been known. Then if the Red sea could forever be closed in behind them, another day of Thanksgiving and prayer would be in order. But as they are here, and most likely to stay, let us hope that they yet may learn to emulate in good qualities the poor drone of the hive, which does but little harm outside of satisfying his enormous appetite, filling the station in life that nature intended that he should, and disappears with the close of the season. What a world this would be if everybody would come as near performing his assigned part in life as does the poor much-abused drone bee!

Sometimes both beekeeper and fruit grower meet with disappointments by the failure of their crops. Then they wear the same kind of clothes. They wrap themselves in coats of hope for future success; they put on caps of faith in their chosen vocation; then feast their hungry souls on rich anticipations. Fortunately, however, the perfection of a man's happiness bears but little relation to the size of his fortune; for he who can lovingly and patiently watch the slow developments from the bloom to maturity of fruit, and carefully protect them from disease and insect pests, and he who can keep himself in tune with the merry hum of the honey bee while skillfully directing it in the production of a crop of honey, that sweet of all sweets, can find happiness and contentment not to be measured by dollars and cents.

Such men are not idlers or drudging slaves on the public highways of life, although their work may be hard and constant; they are in reality students, teachers and rural artists, who understand how to guide nature's travel and paint brush in putting on the finishing touches to their products. They understand that the same great chemist who is compounding the food values of the fruit is filling the prescriptions in the honey laboratories. They are intelligent and worty citizens, and at

present are on very friendly terms. We have now followed this congenial pair from the time when the bee, which a little contrary to the custom of her sex, first went courting the fair flowers and when she trothed her life in kissing life and hope into the fair blossom, on up to where we found a little friction, that justly should not exist; and which was removed by an application of the Golden Rule; and now we find them marching down the aisle strewn with flowers, to the march rendered by the mocking bird high up in the top of the old apple tree, pausing under the smilax for the question. Are there any objections?

IN THE STRAWBERRY FIELD.

(By Henry Schnell, Glasgow, Mo.)

It is about thirty-seven years ago since I got my first inspiration to grow strawberries. This was on the home place of our good old friend and deceased member, Judge Samuel Miller, at Bluffton, Missouri. There I saw the first large cultivated strawberries, a sight I shall never forget, and then and there resolved to have a bed the following year. I also got my first instructions in berry growing at that time.

During this time I marketed quite a few berries, increasing the size of the patch from time to time on the old homestead in Warren county, and in 1882 I embarked in the business of small fruit growing and market gardening at Glasgow.

During this time we have raised some magnificent crops and some very sorry ones, but never have had a total failure. Had as many as twelve acres at one time, but found this too much to handle by express, and not enough to load a car. We now grow only two or three acres for fruit, and find *less* acres and *better* attention more profitable.

Then again, we find that the smaller towns, that were our best markets, nearly all have one or more persons engaged in growing berries for their home market. To ship any distance by express, we cannot compete with refrigerator car loads.

A few remarks as to varieties. We still grow the Bubach, Haverland, Splendid, Beder Wood, and some other old standards for main crop—Texas for early and Grandy and Aroma for late. We have tested hundreds of the later introductions from year to year, and are still doing so, but find the above named hard to improve on, and it seems the limit has about been reached.

The ideal berry, combining all good points of size, flavor, firmness, vigor, and healthfulness of plant, productiveness, etc., will never be

produced. All our best berries have something lacking. There are varieties produced that do exceedingly well where they originate, but when grown in different soils and localities they sometimes prove almost worthless. Every grower should test and keep on testing and find what varieties are best suited for his soil, and plant those. Then again, we have some that will do extra well about one year in three, while others do well most every season.

May, 1906, as you all know, was a very dry month, and our plantings being late on account of other pressing work, we got a very poor stand and plowed up one acre and planted it to late cabbage, while early plantings got a good start and lived through the drouth. This again impressed upon me the necessity of early planting, before the hot dry weather comes.

Next to early planting, thorough and constant cultivation is necessary, and last, mulching. This we find should not be done too early, about December first, or when the ground freezes hard enough to hold up a wagon and team. When mulching with wheat straw, the seed left in the straw will not sprout if put on late. Thickly matted rows should be avoided. In an ideal bed, that will produce the finest and largest fruit, the plants should be about six inches apart.

Such varieties as Splendid, Warfield, Senator Dunlap and others will mat too thickly and need thinning. Runners should be kept off such varieties until August 15th, after which they will make plenty of plants and in favorable weather still too many, and may need thinning besides. We cut all runners on fruiting beds on *all* varieties up to July 15th or later.

Summer planting in July and August is very uncertain, owing to drouths often prevailing at this time; but when a good stand is secured these will be good for a fine crop the following spring.

We use principally stable manure for fertilizing, but this is always applied a year before we set the plants and a crop of cabbage, celery, tomatoes, etc., grown after the manure has been applied.

We have used several different kinds of commercial fertilizers, but must say we have never seen any benefits from them. When the fruit sets well and the season is favorable the crop seems good on all of the fields, the poor spots producing same as richer. The largest crop we ever raised, and I never expect to see another such, was in 1897. We had four acres to fruit; one and one-half acres of this was on a clay hillside, rather thin soil, and such loads of large fine berries we never saw before. From these four acres we picked over thirteen hundred twenty-four quart cases—about eight thousand quarts, three hundred and thirty-

three crates, or two hundred and fifty bushels to the acre. The weather that year was somewhat like we have had this season, 1908, cool with moisture enough. Nothing gets away with a strawberry crop quicker than hot, dry weather or continuous rains.

THE FARM HOME STRAWBERRY BED.

(By George T. Tippin, Nichols, Mo.)

Why every farmer does not have a home strawberry bed is a question that often presents itself to us so forcibly that we cannot put it aside without seeking plausible reasons for it. The fact that so many of our farmers in many sections of the country, some of whom are the very best farmers too, have no home strawberry bed would indicate that there was some good excuse why the home should be deprived of the blessings and comforts to be enjoyed by making the Queen of fruits a member of the family. I can but think that it is because so many of the farm homes not having enjoyed the pleasures of a home strawberry bed do not realize what they are missing, consequently are without them. If this is true, I am justified in taking up a subject upon which much advice has already been given, with the view of bringing more forcibly to our farmers the reasons why a well appointed farm premises should have a home strawberry patch. The strawberry is one of the first fruits to ripen in the spring or early summer, coming at a time when the healthful influences of fresh fruit is most needed after the system has been burdened with the heavier diets during the winter. No fruit is more universally liked and none more appetizing than the luscious strawberry, and no farmer's wife that would not be proud to add to the attractiveness of her table the service of fresh, ripe fruit from the berry garden. It does not require much expense or labor to provide an ample strawberry bed sufficient for the home or even to have your planting large enough to furnish quite a profitable surplus provided you live near a market.

Too rich soil is not best, as it stimulates plant growth rather than production of fruit. A soil that will produce forty to sixty bushels of corn per acre will grow good strawberries. Perhaps some farmers have tried growing berries for home use in the gardens where the soil was very rich and heavily manured; also foul with weeds and grass, under which conditions excessive labor was required, while too many plants were produced and not much fruit, and they became discouraged. Virgin soil when available is preferable, as it requires less work in cultivation

and gives better results. Prepare the soil by deep plowing and thorough pulverizing. Early spring planting as a rule is best. Secure good, strong, healthy plants from reliable plant growers and when ready mark off ground with light marker or use a line, setting in rows three and one-half to four feet wide, and about two and one-half feet apart in the row. Use a dibble or garden trowel in setting plants, being careful to get the roots down well; also spread out, firming the soil well to roots when in position, leaving the crown of the plant when set even with the surface. Cultivate as often as necessary to keep the soil clean and in good state of cultivation until late in summer, when you will have a good plant row for next year's crop.

When the ground begins to freeze in early winter, it is best to mulch between the rows; also covering the row lightly with clean straw, leaves or course prairie hay bedding. Remove the mulch from the plants in early spring, leaving it between the rows to keep the fruit clean. After the fruit is gathered, mow off the vines and when dry burn off. Bar off the rows with a small turning plow, leaving them about six inches wide, and when the sod thus turned between the rows has mellowed, cultivate it back to the plants with cultivator and harrow. A very good plan is, after cultivating down the first time, to harrow crossways of the rows. Cultivation should be kept up until late in summer. By careful renewing, a plant bed can be kept up from four to six years without replanting.

For home use, early medium and late varieties should be selected so as to prolong the season. I would recommend the selection of varieties that are known to do well in the locality where planting is to be made. One-eighth of an acre is ample for a strawberry bed for home use, and would produce a surplus for many families. This amount of ground will easily yield six hundred quarts. Allowing six quarts daily for table use for thirty days during the berry season, one hundred and twenty quarts for canning, preserves, jellies, etc., would still leave three hundred quarts to sell at six cents per quart, which would be $18.00 more than enough to pay the rent, for all the labor and all the sugar necessary to add in making the strawberry the most desirable fresh fruit for table use that is grown anywhere on earth. This is not all their value. The healthful influences of fresh fruits are much underestimated by many people and especially the farm homes that do not have them, which when once appreciated, plus the pleasure and comfort of having it with so little effort and expense, will insure the planting and caring for many more farm home strawberry beds in our country.

GROWING AND HANDLING PEACHES FOR THE CITY RETAIL MARKET.

(By W. G. Gano, Parkville, Mo.)

Where any one is so situated that he can reach a good city market and sell his fruits fresh from his orchard on the morning city market, he can certainly realize better results from his sales than from any other mode of disposing of his fruits. There are times when he can realize profits by shipping portions of his crops. But if he uses fair, honest methods, and grows perfect, handsome and well matured fruit, packed properly in clean tidy packages in the most possible attractive conditions, also his team, harness and wagon and himself should be in harmony, and by being courteous, reliable and punctual in his appointments, he will soon create a demand for his fruit.

In choosing a location and soil for a peach orchard, high, dry, sandy or gravelly loam is preferable, and where a free circulation of air will be had during the dormant period of the tree.

Some varieties demand a light sandy soil, others thrive best on heavier soil. If the land is not too wet or springs too near the surface, and the required food is present, the peach will thrive on a great variety of soils, sometimes surprising the grower, while others fail where all conditions seem to be favorable.

The peach tree should not be set deeper than it stood in the nursery, and when planted should be trimmed to a straight whip, and cut back to within eighteen inches or two feet. All bruised roots should be cut off and a whole dug with a spade (not a crowbar) large enough to contain the roots without jamming them in the hole. When you plant a tree, one-year-old trees should be used, and as to varieties, no man can advise what to plant in every part of the State or even in every part of a single county. Where one is a gold finder, to another, under apparently the same conditions, would be a money loser. The city market orchard should, however, consist of a greater number of varieties than the commercial shipping orchard. My orchard of five thousand trees, that I have planted with this in view, consists of thirty varieties; some, however, are planted in an experimental way.

Commencing with Greensboro and discarding the Hale type, I aim to have a perfect succession of ripening until the latest. My trees are planted sixteen feet each way and I keep them headed low. I try to keep them in a thrifty growing condition, but care must be taken not to force too rank a growth of tree and foliage, as this will surely be at the expense of color and quality of fruit. Early and thorough cultivation is of great importance, but deep plowing should be avoided.

For cultivating I use Clark's reversible extension head cutaway. The land should be kept as level as possible, and if dry, cultivate oftener and later than in wet seasons. For fertilizing I disk in cowpeas. When I am so fortunate as to have a crop of peaches I thin my fruit as a rule to six inches apart and also thin out the fruit spurs if too thick in order to let in sunlight and air.

I pick my fruit in peck baskets, picking nothing but the perfect well matured fruit, and just as the specimen is beginning to soften, so that by the next morning it is ready for the retail trade. The peach is a perishable fruit, and to enjoy its rich, luscious, saccharine taste, which it can only acquire by fully maturing on the tree, it must have a near market and quick and careful conveyance for the consumer to enjoy all of these qualities, which make it at once the most luscious, healthful and popular fruit in our market.

In hot weather, I aim to pick each tree every day, and never at a longer interval than every other day, and I am from two to four weeks in handling each variety. One year I was four weeks in handling my Elbertas and picked peaches six days in the week.

It is astonishing how fruit will grow and develop if this method is practiced. . I try to have trusty, experienced men for my pickers, and for the packers I prefer girls. We pack in climax baskets and generally in seven and eight pound sizes, which hold three rows of peaches and generally from two and one-half to three dozen per basket. When these baskets are neatly and smoothly packed with the bright blush of the peach, and a sprig of the green leaf from the tree placed on each basket, they certainly make an attractive package.

We use this basket for several good reasons:

First. It is neat, strong and rigid, having a solid board bottom and retains its shape in handling.

Second. It is a basket easily packed and is very convenient for the grower, groceryman or consumer.

CO-OPERATION IN MARKETING.

(By W. A. Irvin, Springfield, Mo.)

I could not do this subject justice without infringing on the subject of grading and packing, for there could be no successful co-operation without the control of picking, grading and packing. You must know what your apples are before you can sell them with a guarantee. I am in doubt if Missouri apple growers could follow the example of Oregon

and Washington growers as our territory is so much larger, and the nearest approach would be an association inspector in each orchard after agreeing on what grades to pack. A uniform bushel box is of great importance. The box should hold a full bushel and be substantially made. All choice varieties of apples such as Jonathan, Grimes, Winesap, etc., should be packed in bushel boxes, leaving the ordinary, such as Ben Davis, Missouri Pippin, etc., for barrels. It is absolutely necessary for the apple grower to be sure of successful cold storage at a moderate cost or build a cool storage, or big cellar of his own, in order to successfully handle a full crop like we had last year, and not be at the mercy of the apple buyer, who has engaged all the available cold storage. A concrete cellar of ordinary size, say twenty by thirty by ten feet, can be built for a few hundred dollars, that would hold a good part of the crop until the glut in the market was over, and would pay for itself in a few years. With cement at $2.00 a barrel, sand and gravel handy, an abundance of stone in or taken from the orchard with unskilled labor, every orchardist should be able to build his own cold storage. The agricultural department furnishes a bulletin with full instructions for building a cool storage on the farm. Having done your part in good faith, the most important part yet remains to get a fair price for your apples. I believe the old time method of consigning is all wrong. Yet there are times when it is impossible to do otherwise. However, you can be sure that the parties to whom you ship are financially responsible before the apples go forward. Otherwise you are at the mercy of unscrupulous dealers who do not hesitate to get the best end of the business. Go to your banker and have him look up the standing of the buyers with Dun & Co., or Bradstreet's Commercial Agencies, and if not financially good, do not sell, as you will feel better to lose some apples by deterioration than be swindled out of them. Reasonable transportation is of great importance to the apple grower. If the commission man and the railroads take all the profit there is in the shipment, as was done in a number of instances from our city last year by making the rate double that which was promised before shipment, also the commission man making unjust and untrue claims of shortage, slack, wet samples, etc., there is little encouragement for the apple grower to spend thousands of dollars, and years of time and labor, unless protected in the marketing of his fruit. Eternal vigilance, and proper co-operation, with reasonable transportation and the enforcement of packing nothing but good salable fruit in an up-to-date manner, should aid the sale and enhance the value of fruit on the open market. Like the merchants motto, "Goods well bought are half sold," fruit well grown and properly packed is more than half sold.

Some Horticultural History.—Was not "Johnny Apple Seed" or John Chapman the real originator of the Ben Davis apple? We find that John Chapman first drifted down the Ohio river from Pittsburg, in 1790, with a canoe full of apple seeds in bags collected from the orchards of Eastern Pennsylvania. He would stop along the banks of the Ohio wherever an open glade could be found, plant thousands of apple seeds, weave a brush fence around it, and post a notice for the settlers to help themselves to the seedlings, but to keep the fence in good repair so that the deer would not destroy the seedlings.

Marietta, Ohio, was made his headquarters for a number of years. In the beginning of 1800 he had planted hundreds of the little orchards along both banks of the Ohio river as far west as Cincinnati, Ohio, and Louisville, Kentucky. From 1802 we find this horticultural hero penetrating the country as far as the great Lakes through Ohio and Indiana, even in the heart of a hostile Indian country, with perfect safety and without weapons other than his pruning knife. John Chapman made several trips back to Eastern Pennsylvania for apple seeds which he obtained from the Quakers and Pennsylvania Dutch farmers, who had saved the seed from their best varieties of apples at the request of John Chapman. The first lot of seeds he took west in 1790 he washed from the pomace of the cider mills with his own hands. During the year 1815 he became sick with malarial or typhoid fever on the head waters of the Wabash river and almost unsheltered and alone, came near dying. However, he made his appearance at the nearest settlement clothed with the seed bags and wearing a tin plate on his head for a hat, a mere skeleton. This sickness seemed to enfeeble his mind, and a great many people looked upon him as a crank or crazy. During the year of 1830, he came to my grandfather's farm ten miles south of Mansfield, Ohio, and my grandfather, Lawrence Easterly, offered to purchase apple seeds from Chapman, who refused to sell, but gave him some, and made his home with grandfather while in that part of the country. My mother remembered him as she was a girl of ten years at the time.

Chapman died in September, 1839, and was buried near Fort Wayne, Indiana. Five years ago, in a conversation with George W. Davis, an old gentleman of seventy-five whom I had known for ten years as a business man in El Paso, Texas, mentioned that he believed his father had some claim to the introduction of the Ben Davis apple. As a boy his father's orchard in Arthur, Kentucky, near the Ohio river, contained an apple tree that was noticed as a prolific bearer of big red apples, and a nurseryman who grafted from it named the apple after his father, "Ben Davis," as he was known and called by his neighbors.

This orchard was planted at the time John Chapman had planted his hundred orchards of seedlings along the banks of the Ohio. Now the first record and name we have of Ben Davis apple is Kentucky Streak or Pennsylvania Red Streak. We do not hear of Ben Davis or any of the names in Ohio or Indiana, nor do we know of an apple similar in these states, although the writer is familiar with varieties of those days. There is an effort being made to erect a monument at Fort Wayne, Indiana, in memory of John Chapman, the horticultural hero of the common people, and let each give our mite to aid this worthy cause.

PLANTING AND CULTIVATING THE ORCHARD.

(By H. S. Wayman, Princeton, Mo.)

Planting and cultivating the orchard might be fitly called its structural feature because upon the character of the work does the very life and existence of the orchard depend.

My most approved method of planting is to thoroughly pulverize the ground before planting in spring, but this is sometimes impractical as early planting is always best, and when the season is backward or wet it is sometimes necessary to plow a single furrow, and cross mark or plant by stakes, and cultivate as soon as the ground becomes tillable. For hill land, we plant just one way, making rows horizontal with the hill without regard to direction or straight rows. This tends greatly to prevent the soil from washing and makes cultivation a less arduous task.

Another help in holding the soil is to plant the tree rows in strawberries or raspberries, which do quite as well as the weeds, which otherwise are usually allowed to grow.

In marking off the ground, we use a large two horse turning plow, or better still, a corn lister with subsoiler attached with which the soil can be thrown out almost deep enough so that with a lively boy to place the trees in position the man with the spade can easily plant one thousand trees per day.

Immediately after planting we go over the rows with a two horse cultivator with shovels set to level up the ground.

In the matter of cultivation, I know of no better method than that of the nurseryman who cultivates the ground once or twice a week from the time trees are planted until about the first of July, or if the season is dry, cultivate two or three weeks longer. At the last plowing the ground should be sown to oats, cowpeas, or a crop of weeds allowed to grow to

check the growth of trees so the wood may ripen up for winter, and as a cover crop or winter mulch, which protects the tree roots from severe frost and adds humus to the soil. Shallow cultivation is usually preferable. I have no serious objection against deep plowing if kept up from the start and the ground is not too rolling, but for the average Missouri hills there is danger of impoverishing the land by washing rains.

We use the orchard reversible disc, and if the season is dry follow each cultivation with the "Acme," or some other pulverizing harrow to maintain a dust mulch, which helps to conserve moisture.

No certain rule or method can be adopted except as suited to the conditions in question. However, most all conditions admit of thorough cultivation, which insures a more vigorous growth of wood, or fruit, as the case may be; it renders the trees less susceptible to disease; it destroys to some extent the insect pests and thereby lessens the necessity of spraying; hence in the language of Colonel Evans, "thorough cultivation is the watchword of the successful orchardist."

MARKETING PEACHES.

(By R. M. Hitt, Koshkonong, Mo.)

I once heard a prominent fruit grower remark that "Anyone can grow peaches but very few can market them," and I believe there is more truth than fiction in the remark. Not that I claim to be numbered among the few, but because I have met with some of the difficulties and can realize in a measure what one has to contend with to successfully market a crop of fruit of any kind.

What pleasure and enjoyment one finds in the fruit business is derived from the growing of crops, but marketing is the real foundation of the industry from a business standpoint. Of course, in order to market a peach crop it is necessary to have the peaches, and the better the quality of the fruit the simpler the problem of disposing of them, and we can greatly assist in the marketing by growing and handling the best quality only, as far as possible. When the quality is good, the marketing is half done.

Marketing the first crop begins when we are watching the different fruit journals in the early spring to keep posted on the conditions of crops in our competing territories and ends when the bank book is balanced after the last returns are received.

We need strong co-operation among the fruit growers of all competing territories, not for the purpose of making any unjust demands

upon the public as to what they shall pay for a crate of berries or peaches, but to properly distribute large crops so that every market will be proportionately supplied. This idea seems to be rather theoretical at the present time, but by perfect organization, such as exists in nearly every other line of business, it could be accomplished and probably will be at some future day.

I have heard always a great deal of complaint about the commission men and whenever we meet with failures in the sale of our peaches we lay the blame on these broad shouldered fellows and say that they got all the profit there was in our peach crop. I am a believer in commission men and don't care to continue in the fruit business without them. The per cent of honest ones will average well with any other business. The trouble with us farmers is that we are not well enough acquainted with them, and when we are doing business with a stranger all the mistakes, of course, belong to him. I would like to see the commission merchants in their organizations do more to force out of business those who are irresponsible and have no business nor moral stability.

There is a class among fruit growers also who damage our standing and lead commission merchants to believe that the farmers as a class are rascals and dishonest.

To more successfully market our crops we must get better acquainted with the men who we expect to help us. I have told numbers of fruit growers in the south part of the State that they could learn more about marketing and packing their crops by spending one season on the market shaking hands and getting acquainted than they could learn in several seasons on the farm.

In conclusion, I would say that the marketing of a peach crop resolves itself into the following conditions:

First. Grow a peach that is marketable.

Second. Pack it in a marketable shape.

Third. If possible, get in close touch with the men you expect to handle your shipments, no matter whether you expect to sell or consign. We have to deal with too many strangers.

PROFITABLE APPLES FOR NORTHERN MISSOURI.

(By J. E. May, La Plata, Mo.)

When we consider the fact that the variety that has always stayed by us and the only variety that we could depend upon through thick and thin has been kicked and cuffed from one end of the continent to the other for the past few years until the people have come to believe it to be

little, if any, better than a pumpkin, I say the subject of profitable varieties of apples for Northern Missouri is a rather hard one. It is a fact though that with a crop of apples like the one we had a year ago, it is almost impossible to sell Ben Davis at a profit. We have been favorably impressed with the behavior of the York Imperial, but last fall shipped a car load of Bens and Yorks and received less for them by twenty-five cents per barrel than the lowest quotations for apples at that time, and when we took the commission firm to task for not getting more for the York they said the York was not classed any higher in their market than the Ben Davis. So there you are. Perhaps the variety of commission firms has something to do with the matter, who knows! The profitable variety for the average planter of Northern Missouri has not yet been discovered. It will take a variety that is proof against rabbits, borers, codling moth, and the fungus diseases; one that will stand no cultivation, can be pruned by the cattle, horses and sheep, and produce an apple that is equal to the Grimes and Jonathan in quality. Honestly, Mr. President, I think I am in a quandry, with the experience I had last fall, to know what to plant. The Ben Davis has made us some money, but we need a variety that bears well, and will sell when we have such a crop as the one of 1906. Shall it be Jonathan? With us this drops badly and is too early for a winter variety. The same can be said for the Grimes. This year, with the worst weather the oldest inhabitants ever saw, about all the apples we will have are the York Imperial, trees of this variety having all the fruit they should carry. We also have an Ingram tree that shows some fruit. If I were to name the varieties I think will pay in North Missouri, would say Ben Davis (when there are not too many other apples), Gano, York Imperial and Huntsman. These, with care, will one year with another show a profit to the grower.

REPORT OF COMMITTEE ON AWARDS.

We, your Committee on Display of Fruits, award the following premiums:

Dan Lowmiller and W. G. Gano, Parkville, Missouri, $2.50 for exhibit of forty-seven plates of apples consisting of the following varieties:

York Imperial, Little Red Romanite, Gano, Milan, Huntsman, Ben Davis, Mann, Stark, Jonathan, Grimes Golden, W. W. Pearmain, Spitzenberg, M. B. Twig, Willow Twig, Yellow Bellflower, Ortley, Pennsylvania Red Streak, Fallawater, Winesap, Roman Stem, Gilpin, Ingram, Winter Sweet Pearmain, Lady Sweet, Missouri Pippin and Janet.

The above varieties were in very fine condition and the quality was exceedingly good and a better display could not be had any year.

J. H. Darche, Parkville, Missouri, eighteen plates apples; one plate Kiefer pears, $1.00.

Varieties—Grimes Golden, R. I. Greening, Smith Cider, Domine, York Imperial, Winter May, Jonathan, Huntsman, Missouri Pippin, Ben Davis, Lady Sweet, Willow Twig, Gano, White Pippin.

The condition of the above display was fair to good and of good quality.

The basket of Miller Persimmons, sent by J. C. Evans of Harlem, was exceedingly fine and enjoyed very much by those who tasted them.

Signed by the Committee,

BENJAMIN C. AUTEN,
CHAS. L. GLASSMIRE,
W. T. FLOURNOY.

CO-OPERATION AMONG FRUIT GROWERS.*

(By W. H. Chandler, Assistant Professor of Horticulture, University of Missouri.)

SUMMARY.

The growth of co-operation among fruit growers in the United States and Canada has been very rapid during the past ten years.

The Missouri Experiment Station has letters from the managers of fifty-four associations, not including sub-associations of large exchanges; and from trade papers and other sources, has the addresses of 256. Many of these associations do a very large business.

While there have undoubtedly been many failures, taken as a whole, co-operation has unquestionably been a great success. In many sections the growers have been greatly benefited in price, and in increased production and quality. The year before the Ozark Fruit Growers Association began operations in Missouri, many strawberry growers were going out of the business because of poor prices. Largely through the efforts of this association, the strawberry business is probably the most prosperous of any agricultural business in the State.

Some of the benefits of co-operation are:

It enables small growers to ship in car lots.

The crop may be distributed so as to prevent gluts in the market.

---

*This is Missouri Agricultural Experiment Station Bulletin No. 97, which is reprinted by permission.

Fig. 53. One of the packing sheds used by the Koshkonong-Brandville Fruit Growers' Association in the season of 1910. One member of this association, with 370 trees (less than three acres), reports a net profit, above all expenses of cultivation, spraying, pruning, packing, etc., of $673.43 for the season of 1910. Another, with ten acres, reports a net profit of more than $1,500 for the same season. With efficient co-operation, these small growers are likely to be the most prosperous fruit men. Without co-operation, in case of peaches and strawberries at least, it is practically impossible for them to dispose of their crop to good advantage.

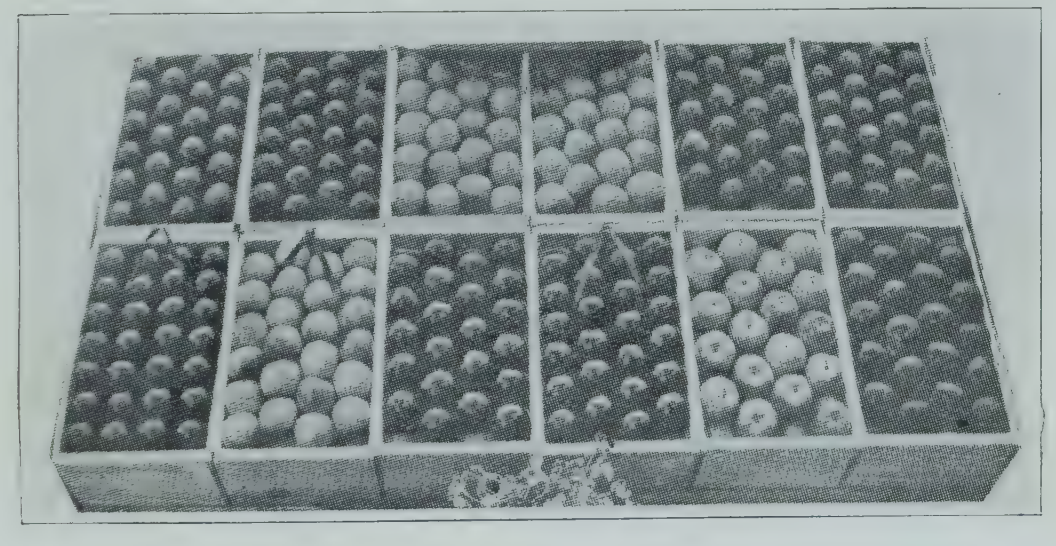


Fig. 54. Boxed apples packed at Hood River, Oregon. The reputation for an honest pack acquired by the Hood River Apple Growers' Union unquestionably means greatly increased prices for the members of this union, as well as for the independent growers who profit by the reputation the association gives the district without doing their share toward maintaining the association.

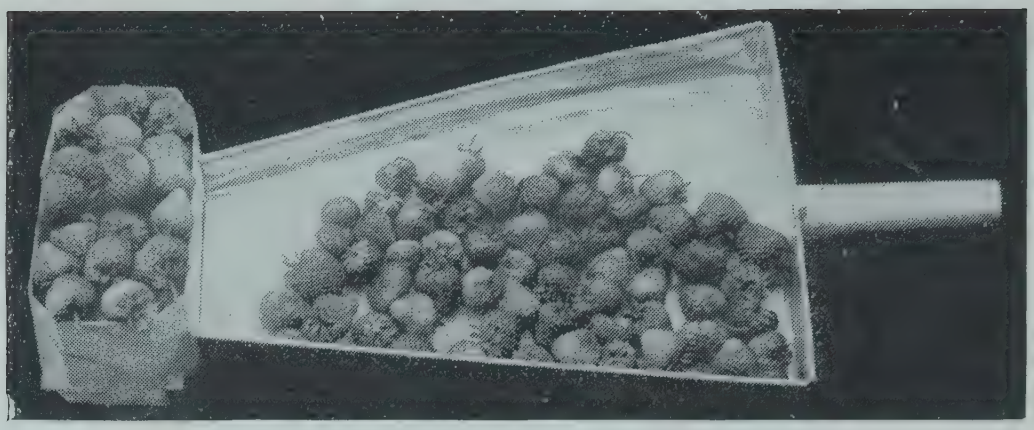


Fig. 55. Tin scoop into which boxes of berries are emptied and culled in the Growers' Sheds. This method has been used at Pierce City with excellent results. It is being urged upon all the associations that ship through the Ozark Fruit Growers' Association. Its use should considerbly improve the market standing of Ozark strawberries, good as that now is.

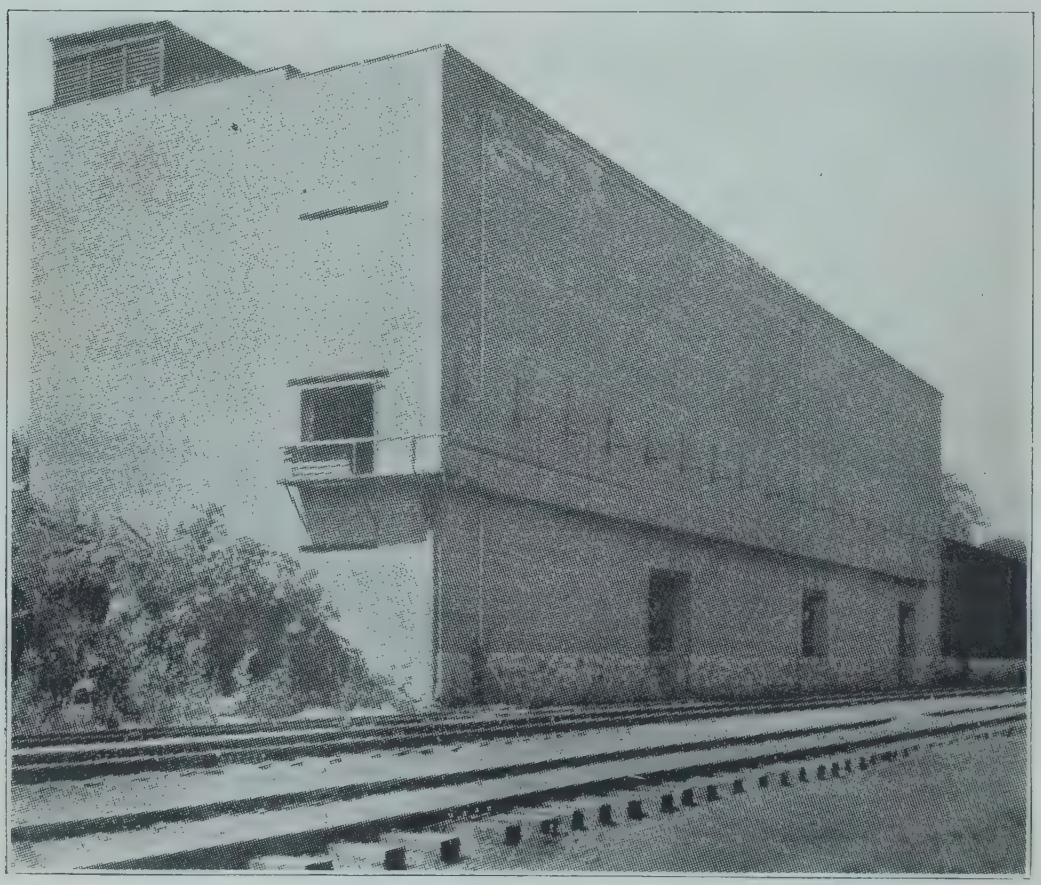


Fig. 56. Cold storage plant of the Hood River Apple Growers' Union. There is likely to be better equipment for handling the crop in an organized section because of the concerted action of the growers, and the greater stability that generally prevails.

It enables the growers to establish a brand that will be known in the markets, and will thus insure better prices.

It makes possible better business methods in dealing with the fruit buyers, transportation companies, etc.

It enables a community to make use of varieties of fruit that for any reason it may not be desirable to grow except in small quantities.

It generally brings better equipment, such as cold storage plants, etc., for handling the fruit crop of a section.

It insures better care of the orchards.

In nearly all cases it results in greater stability of the industry.

Some of the difficulties in the way of co-operation are:

(1) Since the chief benefits from co-operation are in distributing the crop and establishing a reputation for the section, independent growers in a section where an association is located will receive these benefits and get nearly as good prices as members of the association. Since this is true, independent growers will be slow to come into the association, and members of the association who see the independents doing as well as they without having to pay their share toward the support of the association, may tend to drop out.

(2) A spirit of envy, and lack of confidence in and loyal support of the association by the members.

The size and organization of an association will have to be adapted to the conditions of each particular section. However, generally speaking, the most promising type of association is one that handles a large share of the output of fruit or produce from any section with natural environments uniform enough to produce a fruit with uniform characteristics for the entire section. This general association should in almost all cases be divided into well organized sub-associations so that there will be personal contact from the general manager through the local officers to the members of the small associations.

In the apple industry the principal benefit from co-operation is in establishing a grade that will be rigidly maintained from year to year. For this reason co-operation in the apple business must necessarily begin on a small scale and enlarge as the growers become accustomed to rigidly maintaining a high standard.

GROWTH AND APPARENT SUCCESS OF CO-OPERATION AMONG FRUIT GROWERS IN AMERICA.

The growth of co-operation in marketing fruit, in the past ten years, has far surpassed the expectations of the best informed men interested in the fruit business. In a text-book on "Fruit Harvesting,

Storing and Marketing'' published in 1901, an author says: ''Numerous associations, some comprising only two or three neighbors, some involving large capital and considerable organization, have been formed in this country. On the whole, their experience has not been encouraging. Co-operation has been successful in some cases; but the writer does not know of any conspicuous instance of such success; nor of any continuously successful organization on any scale.'' This estimate of co-operation has not been supported by later experience. The Missouri Experiment Station has secured the constitutions and by-laws and letters from the managers of the associations given in the following list; some of them handling nearly fifty million dollars worth of fruit in a year, and many of them handling more than one million dollars worth in a year:

California Fruit Exchange, Sacramento, Cal.
California Fruit Growers Exchange, Los Angeles, Cal.
Mountain View Orange and Lemon Growers Association, Upland, Cal.
Monmouth County Farmers Exchange, Pomona, Cal.
Orange County Celery Growers Association, Santa Ana, Cal.
Walnut Fruit Growers Association, Walnut, Cal.
Cahuenga Valley Lemon Association, Colegrove, Cal.
Sebastopol Berry Growers, Inc., Sebastopol, Cal.
Mutual Orange Distributors, Redlands, Cal.
The Producers Association, DeBeque, Colo.
Grand Junction Fruit Growers Association, Grand Junction, Colo.
Surface Creek Fruit Growers Association, Austin, Colo.
Lamar Melon Growers Association, Lamar, Colo.
Roaring Fork Potato Growers Association, Carbondale, Colo.
Boulder County Fruit Growers Association, Boulder, Colo.
The Peach Growers Association, Palisade, Colo.
Fruita Fruit and Produce Growers Association, Fruita, Colo.
Rogue River Fruit and Produce Association, Medford, Oreg.
The Dalles Fruit Growers Association, The Dalles, Oreg.
Hood River Apple Growers Union, Hood River, Oreg.
Eugene Fruit Growers Association, Eugene, Oreg.
The Salem Fruit Union, Salem, Oreg.
The Sutherlin Fruit Growers Association, Sutherlin, Oreg.
Texas Citrus Growers Association, Houston, Tex.
Southern Texas Truck Growers Association, San Antonio, Texas.
Farmington Fruit Growers Association, Farmington, N. Mex.
Georgia Fruit Exchange, Atlanta, Ga.
Crescent City Citrus Growers Association, Crescent City, Fla.

Oxford Truck Growers Union and Benefit Association, Oxford, Fla.
Citrus Exchange, Tampa, Fla.
Lyman Planters Association, Lyman, Miss.
Iberia Truck Growers Association, New Iberia, La.
Humboldt Fruit Growers Association, Humboldt, Tenn.
Truck Growers Association, Jackson, Tenn.
Fruit Growers Association, Medina, Tenn.
Eastern Shore of Virginia Produce Exchange, Onley, Va.
The Virginias Fruit Exchange, Charlestown, W. Va.
Burlington County Farmers Exchange, Mount Holly, N. J.
National Fruit Exchange, Jersey City, N. J.
Peninsula Produce Exchange, Pocomoke City, Md.
Queen Anne County Produce Exchange, Centerville, Md.
The Neosho Fruit Growers and Shippers Association, Neosho, Mo.
Ozark Fruit Growers Association, Monett, Mo.
Sarcoxie Horticultural Association, Sarcoxie, Mo.
Anderson Berry Growers and Shippers Association, Anderson, Mo.
Koshkonong and Brandsville Peach Growers Association, Koshkonong, Mo.
Judsonia Fruit and Vegetable Growers Association, Judsonia, Ark.
Little River County Fruit and Truck Growers Association, Ashdown, Ark.
Island and Gypsum Fruit Company, Gypsum, Ohio.
Boston Market Gardeners Association, Boton, Mass.
New England Cranberry Sales Company, N. Y.
The National Fruit Exchange, Chicago, Ill.
Fruit and Produce Exchange, Revestroke, B. C.
Fruit and Truck Growers Association, Lawton, Okla.

Besides these we have secured from trade papers and other sources the addresses of two hundred and three other associations in various parts of the country, not including sub-associations of the large exchanges like the California Fruit Growers Exchange. Some of the associations named above are working on a small scale, but some of them are working on a very large scale, and many of them have been very successful. The greatest co-operative concern is the California Fruit Growers Exchange which markets citrus fruits. It is the central organization for sixteen sub-exchanges marketing for ninety-eight sub-associations in various parts of California. It has enabled the industry to overcome obstacles that many of the best informed people of California think it would never have survived, and to develop until this season there was said to be 45,000 cars on the trees. An example of its excellent business management is seen in the fact that it marketed

$58,000,000.00 worth of fruit and collected all except $318.00. For four years the average loss from bad accounts has been one cent on each $40.00 worth of sales. That it has worked to the best interest of the growers is seen by the fact that it has been operating for fifteen years or more, and yet eighty per cent of the growers who control more than seventy per cent of the crop, still ship through it.

In Texas the Southern Texas Truck Growers Exchange has been so successful in marketing the crop of onions that while in 1905, before the association was organized, there were only 400 carloads of onions shipped from that section and then the returns were so poor that there was little profit; in 1909 about 2,500 carloads were shipped, and the manager said that if the returns had been pooled, every grower would have made money in spite of the very large crop.

The Florida citrus growers have organized an exchange; and the Georgia peach growers have been co-operating for two years under an exchange that such eminent growers as J. H. Hale claim has been very beneficial to the growers.

Under the management of the Eastern Shore of Virginia Produce Exchange, the business of that section has increased until in the past year over a million barrels of Irish potatoes, about 800,000 barrels of sweet potatoes, besides quantities of berries, onions and cabbage have been shipped, making a total business for the year of over $2,500,000.00; yet the Empire Produce Company of Elmira, N. Y., recalls the fact that before the organization of this association it was unsafe to buy Virginia sweet potatoes because of the uncertainty of the pack.

The Peninsula Produce Exchange in Maryland has been very successful; bringing better returns to the growers, generally increasing the business, and giving a greater spirit of confidence and thereby increasing land value and general business stability, as attested by the secretary, and as able an individual grower as Mr. Orlando Harrison.

In Canada, especially in the Province of Ontario, there are about thirty-five co-operative associations, and while the apple industry in the Province as a whole is rapidly declining, in the sections influenced by the successful growth of these associations it is very prosperous. This is especially true of the Norfolk Fruit Growers Association. In ten years, according to Mr. Johnson, the manager, the yield from the orchards has been increased four or five times, though the orchards at the beginning of the association were about twenty years old and should have been at their best. So successful has the business been in this district that Mr. Johnson paid $17,000.00 for a forty-acre orchard, thirty-two years old, that had actually changed hands ten years ago for

$6,000.00, though the orchard should then have been as productive as it is now. It is claimed that the Huron district in Canada is in every way as well adapted to fruit as any other section of Ontario, and that the varieties planted are good, but co-operation has not secured a foothold there and the industry is rapidly declining.

It will probably be admitted by all that the growers of the Northwest come as near to realizing the greatest possible returns from their fruit as any other section of the country, and they have such exceedingly well managed associations as the Hood River Apple Growers Union, Wenatchee Fruit Growers Association, Rogue River Fruit Growers Association, Salem Fruit Growers Union, Eugene Fruit Growers Association, and possibly others, while new ones are being organized, and there is an effort to get the whole Northwest organized under one selling management.

Colorado also has a great reputation for its fruit and produce, and is generally under competent organization. It has such associations as the Grand Junction Fruit Growers Association, one of the best in the country; Fruita Fruit and Produce Association; Surface Creek Fruit Growers Association; North Fork Fruit Growers Association; The Roaring Fork Potato Growers Association; Holly Fruit Growers Association; Manzanola Fruit Association; The Palisade Peach Growers Association. There is just organized a new large association that will replace some of the above named.

In the cranberry business there are the National Fruit Exchange and the American Cranberry Association which market nearly all the crop, and have put the industry on a much more stable basis.

We do not have to go away from Missouri to see the great benefits of co-operation in marketing fruits. At Koshkonong the past year the Koshkonong and Brandsville Fruit Growers Association was organized, and was very successful. One man with 370 trees reports a net profit above all expenses of growing, spraying, etc., of $673.43. Another reports more than $1,500.00 net on ten acres. Thus the small growers are being given confidence, and we may hope to see the industry developed with many small, well cared for orchards.

Probably no section has the strawberry business better organized than has Missouri. Of course, it it true that some sort of an organization is absolutely necessary to enable growers to ship strawberries in carload lots, and some Missouri independent associations have been more successful and better managed than most of the local associations to be found in other sections; while the Ozark Fruit Growers Association, which markets the fruit for about twenty-five local associations, has been very successful indeed, bringing the price of strawberries for

those associations that ship with it from about $1.00 net previous to its organization in 1905, to more than $2.20 in 1910. Concerning the results the first year (1905), Mr. Rogers, the manager, says in the Third Annual Report of the Missouri State Board of Horticulture: "At the close of the shipments for the season of 1905, I sent an inquiry to all the associations shipping through the Ozark Fruit Growers Association that year, asking for a statement of the results of the shipments the year previous. This brought replies from twelve associations. We were thus prepared to compare results under independent and under co-operative plans of marketing. The result showed such a difference in favor of co-operation that I thought it might be due to a lighter movement in 1905 than in 1904. So I asked the Traffic Department of the Frisco for the movement over its lines in 1903, 1904 and 1905. Their reply showed a heavier movement in 1905 than in either of the two years previous. So I could come to no other conclusion than that the difference in results was due to a difference in method." The association is fortunate in having exceedingly good management. It is giving satisfaction in the territory it represents, as well as to the trade with which it deals. Quite a number of dealers in letters mention the Ozark Fruit Growers Association as a model for efficient management. Mr. W. B. Palmer of Palmer & Company, Sioux City, Iowa, says: "There is an organization in Southwestern Missouri, known as the Ozark Fruit Growers Association, that we think is particularly well managed, and should receive greater encouragement from the growers of that section. We believe this association has been instrumental in securing at least 25 per cent higher prices for strawberries in Missouri and Arkansas within the last three years than if the association did not exist."

The A. Grossenbach Company of Milwaukee, Wis., says: "We are thorough believers in shipping associations. We point to one in your own State—The Ozark Fruit Growers Association—as one that has been very successful, and one that has raised a standard of considerable value, by co-operating, their system of inspection and placing their goods throughout the country."

The association is working progressively to improve the standard of the berries shipped out and to get uniform packages and grades. The inspectors of the different local associations meet at Monett at the beginning of the season, and have lessons and discussions on grading; thus hoping to have the same ideals prevail in grading the berries of all the local associations. There is also an efficient general inspector who visits all of the local associations as often as possible to encourage a uniform system of grading. It also keeps a set of men in the

market to keep the management informed as to market conditions; to look after the growers' interests at the market end of the line; to make adjustments with the buyers; to look after the icing, and if a car cannot be sold before it should start rolling, to see that it is billed from some shipping center through which it must pass on to the place where it is later sold. Thus the Ozark does not wait for business to come to it, but it has its men in the market to go after the business, as well as to keep the association in personal touch with the market.

Letters from growers in nearly all of the associations that ship through the Ozark testify that it has been of great benefit to the new associations in helping them to organize the berry industry. In fact, it is doubtful if a number of points would be shipping now if it were not for the Ozark. It is thus pushing strawberry growing out into new territory, which is certainly much to be desired by anyone interested in the best development of the Ozarks, since the strawberry business is somewhat more certain than other lines of the fruit industry.

SOME BENEFITS FROM CO-OPERATION.

While the best argument for co-operation is the achievement of the different co-operative associations, it is well to inquire into some of the most important means by which co-operation benefits the growers. From the experience of the associations mentioned above, we may say that the principal benefits from co-operation are:

(1) Enabling the small growers to ship in car lots.

(2) Distributing the crop so as to prevent gluts in the markets.

(3) Enabling the growers to establish a brand that will be known and sought in the markets, thus insuring better prices.

(4) Making possible better business methods in dealing with the fruit buyers, transportation companies, etc.

(5) Enabling a community to make use of varieties of fruit that for any reason might not be desirable except in small quantities.

(6) Better equipment for handling the crop for a section.

(7) Insuring better care of the orchards.

(8) Giving greater general business stability.

Shipping in Car Lots.—With many crops like strawberries it is not easy for one man to grow enough to ship in car lots every day. Thus when strawberries must be sent to a distant market, some form of co-operation is practically indispensable. With peaches, too, ten to twenty-acre orchards are profitable if the fruit is marketed to a good advantage. Yet with an orchard this small, not enough peaches could be picked to ship every day except by express to nearby markets. Co-operation is thus indispensable to the small grower.

Distribution of the Crop.—A benefit of co-operation that is most generally urged and is especially important with perishable fruit is proper distribution of crops to prevent glutted markets. While the commission men have a personal contact with the market and are in a position to place a given amount of the product at any point to a good advantage, they are not in a position to limit the amount that will be put upon the market and prevent gluts. The commission men themselves generally admit this. Mr. F. B. McKevitt, manager of the California Fruit Distributors, says: "Unless your fruit passes through one channel, which has all information in regard to shipments, amounts going into different markets, and the condition of these markets, you will never achieve success. As long as a number of different organizations are in the field working independently, you will always be working at cross purposes, and the results are sure to be disastrous. Your own competition will kill the price of your products, and this is entirely to your own disadvantage with no corresponding advantage to the people who buy and handle your products, as owing to this competition there is always uncertainty in regard to cost of goods delivered; and each dealer is afraid that his competitor will be able to get the same goods for less money, and he is, therefore, unwilling to take hold and push the business as it should be."

Mr. J. S. Crutchfield of the Crutchfield & Woolfolk Company of Pittsburg, says: "Ordinary commission men do not have the facilities, and the mere fact of his knowledge of the various lines does not necessarily make him eligible to take charge of the marketing and distributing of the entire crop from the shipping point."

Mr. W. G. Grupe of the Lagomarcino-Grupe Company of Burlington, Iowa, speaking of the time before the Ozark Fruit Growers Association was organized, when he was dealing in fruit by individual shipments, says: "We were unable to obtain supplies sometimes for a number of days, then again we might come down in the morning and find four or five cars of berries on our tracks."

Mr. George G. Grupe of the Cedar Rapids, Iowa, branch of the same company, says: "I have in mind one locality where a great many watermelons are grown. The growers market their melons individually. It always seems to be a waiting game with the buyers as to how quick the market will break, for if we buy one car of melons, the other individuals who do not sell are liable to sell cheaper to our competitors or run cars of melons into our towns to see if they cannot get more for them than they are offered at the shipping point. The consequence is that nearly every season the market declines very much until there is no profit in melons, and everyone that touches them gets sick of the

proposition, whereas, with intelligent distribution all markets could be reasonably firm and better net results obtained."

It was generally the opinion in letters received from commission men that the commission man is in a position to dispose of fruit and produce for an association to a better advantage in one market than an association would be able to do if it sought to eliminate the commission man, but as to distributing their output over the entire United States, the association is in a better position to get good results. One commission man mentions the fact that the Southern Texas onion growers, before the organization of the Southern Texas Truck Growers Association, got practically nothing out of their onions because of poor distribution. Often they would all consign to one market, so that while some markets would be badly overstocked, others would have no onions, though now with the association the growers are all doing well.

Mr. I. M. Fleming, manager of the Georgia Fruit Exchange, says: "Every commission man in the markets making a specialty of fruit will solicit an unlimited quantity of fruit on any particular day, or every day. In the case of the markets of reasonable size that can accommodate one or two cars of peaches a day, they send out a quotation to twenty-five or thirty carload shippers, and I have one concrete case in mind which happened in 1910, where a small market in Ohio sent out a quotation of about $2.00 a crate for Elberta peaches. The market could possibly have handled one and one-half or two cars of peaches in a day—instead of that quantity, there were seven cars shipped by independent shippers out of Georgia the same day. The majority of the shipments barely paid freight charges, and it took the market a week or ten days to react."

These quotations are given with no intention to disparage the commission man. Under severe competitive conditions I do not see how a commission man can hope always to get fruit enough to supply his trade without in many cases sending out quotations to more growers than he expects to receive shipments from. It simply shows the impossibility of having perishable fruit properly distributed without co-operation. With individual shipments, if the markets are not oversupplied, they are as likely not to be sufficiently supplied. It seems to me then that instead of decreasing consumption, as some of the trade papers maintain, co-operation will increase consumption by keeping the markets uniformly supplied, so that dealers can push their business with confidence. This conclusion is further strengthened by the fact that under effective co-operation the business has almost always had uniformly rapid growth.

Establishing a Brand.—Another great benefit from co-operation is in enabling the growers to establish a pack that will be uniform enough to give confidence and the goods offered in large enough quantities to impress the market. A commission company doing a very extensive business says that while in a few cases co-operation has not improved the quality of the goods shipped, in at least seventy-five per cent of the cases it has, and with the larger associations it certainly always has. Out of thirty-seven letters received from commission men, at least twenty-six held that co-operation was the best for the growers, and in nearly every case the principal reason given was that they produced a better quality of goods that the trade is glad to pay for.

The benefit from co-operation is not only in obtaining a better quality of goods, but in getting that fact known to the trade, so that the association brand on the goods will be known and the grower will thus get all the benefit from the better quality.

The great demand for Virginia sweet potatoes since a definite pack has been established has already been cited, and everyone is familiar with the high prices received by the growers from the Hood River and Wenatchee associations in the Northwest, due entirely to the well established grade, and the fact that a buyer can know exactly what he is buying. The following is a quotation from a letter from Steinhardt & Kelley to the Rural New-Yorker: "First, you would like to know if the packing of the Hood River apple is so perfect that we accept them without close investigation. Not only do we accept them without close investigation, but we accept them without any investigation whatever, leaving the entire matter up to the Hood River Growers' Union, a body of men with about nine directors under whose personal supervision all the fruit is packed and shipped to market. Our dealings with these men for the last three years, during which time we have purchased their crop, have always been of such a straight and upright character that we have never had occasion or cause to doubt their packing, and we have never been disappointed in our business dealings with them. We have handled several hundred thousand boxes, and never have we found ourselves in condition to make a single complaint against their pack. It is as near perfect as human ingenuity and honesty of endeavor can make it; in fact, we shall be glad to have you drop in our place of business at any time and take a box of fruit from any heap, and you will find that every box is practically identical, and that every apple is absolutely perfect, whether you open the top, bottom or side of any package." Such a reputation means money to the members of the association.

One critic of the Ozark Fruit Growers Association, who took stock

when it was organized, says that it was his idea that it would be an association not with an elaborate marketing machinery, but simply with some inspectors and a definitely established brand for Ozark fruit so that any grower could put this brand on his fruit and have it known in the market. Such an idea would seem to be ridiculous, for if this brand was not always associated with a definite grade of fruit, it would mean absolutely nothing in the market. Mr. Crutchfield, of the firm of Crutchfield & Woolfolk, aptly puts it; "A brand which has no stability of character, i. e., uniformity, is injurious to the sale of goods rather than beneficial, for the same reason that a 'plain every day man' will be trusted and is worth more than a man of higher qualifications who makes large professions but can not be *depended upon.*"

For a brand to mean anything, the goods must be packed not only by a trained packer, but by a packer trained to pack goods for that particular brand or set of brands. As mentioned above, probably the most successful association for the establishing of a brand in this country is the Hood River Apple Growers' Union. The following taken from the Statement of Facts issued by the Union should be of interest: "The Union up to this date has always employed packers and inspectors to insure a uniform grading of fruit. The growers individually pay the packers, and the inspection charge has usually been deducted from the general expense account. A complete system of inspection is attempted from the time the grower begins packing the apples until the apples are finally stored in the warehouse ready for shipment. The field inspectors look out for the inspection until the apples are packed and the warehouse inspectors make a final inspection as the apples are received at the warehouse. Apples not graded up to their requirements are set aside for further adjustment, which consists of putting such fruit into a lower grade, or repacking."

Mr. Wilmeroth, now manager of the Rogue River Association, says: "As long as there are apples grown you will never succeed in having the growers in any fruit section put up a uniform pack of apples. Growers who raise apples, in fact any kind of fruit, are just like a parent—we all think our children are the best, and we all think our apples are the best raised, and it is very hard to see any imperfection in them. At apple shows and conventions, growers will talk about what should be done in grading, and then go right home and grade however they desire.

"In some Valleys of the West when packing time comes the registered packers go into the packing houses and the farmers have absolutely nothing to say regarding packing and grading. The packer

is registered with the Union and responsible to the Union for quality and pack.

"I believe one solution of the packing problem would be to have a central packing house or a packing school each year whereby packers could be taught and foremen instructed so that they could take charge of every orchard and then hold them responsible."

However the grading is done, it is certain that the association brand should go on only goods graded and packed under efficient supervision by the association, and it is further certain that it should be sold by the association to keep the growers from under-bidding each other; otherwise the full benefit of the good pack can not be received by the growers, and the growers can not be held together.

Better Business Methods.—Co-operation further enables the growers to make use of better business methods.

(1) It enables them to meet on equal terms the men with whom they deal. Mr. W. L. Newcomb of the Sebastopol Berry Growers Association, says: "Many people think they lose their independence by joining an association of this kind when it really is the only means of making them independent." And this is certainly true. The dealer is generally equipped with better knowledge of the market; and he controls a larger business. This makes him relatively independent of any particular shipper, unless the shipper is a very large one. For the grower to meet the buyer on equal terms, he must know the condition of the market as well as the buyer knows it, and must control a business large enough to attract the interest of a large portion of the trade. Accurate first-hand knowledge of the condition of the market can be secured only by having representatives in the market. Large growers often have representatives in one or two of the larger markets, but it would generally have to be a very large grower that could afford representatives in enough of the markets to make him really independent. An association, especially a large one, can have such representation in all the markets reached by the crop, and the greater the association, the more market information can be afforded and the cheaper it comes to each grower. Thus, under co-operation the association can have a manager who thoroughly understands the markets in a general way, and if it is perishable fruit, can have men at all the important market centers the goods are to reach. Then with all the growers and a good pack behind him he controls a business that demands respect, and he should generally be able to set the price. Mr. J. S. Crutchfield of the firm of Crutchfield & Woolfolk of Pittsburg, in an address before the American Cranberry Growers Association, January 26th, 1909, said: "The selling agent should always make the price. Whenever a sales-

man gets himself into such a position that he must depend upon the buyer to name the value of his goods, he always suffers to the extent of from ten to twenty-five per cent.'' This is the judgment not of a representative of an association but of a representative of a large commission firm.

(2) By co-operation it is generally possible, or it may often be possible, to force track selling. Mr. P. A. Rodgers, manager of the Ozark Fruit Growers Association says: ''In managing the Ozark Fruit Growers Association I am convinced beyond any doubt that selling brings better results than consigning. For instance—in 1905 we consigned 294 cars and sold on track 226 cars. The average price on cars consigned was 90 cents per crate and on cars sold on track $1.27 per crate, a difference of 37 cents per crate on cars sold. In 1906 we sold on track 288 cars and consigned 272. The cars sold on track averaged $1.66 and the cars consigned returned $1.00, a difference of 66 cents per crate.'' These figures are probably exceptional, yet Mr. J. B. Graves of the Neosho Fruit Growers & Shippers Association is just as strongly in favor of track selling, and from the letters received from fruit men selling individually and members of associations from all over the country, there seems to be almost unanimity of opinion that track sales are the best. This opinion is shared also by a large percentage of the commission men, especially those in the Middle West. Of course the differences between the results of track selling and consignment are possibly not as great with co-operation as under individual selling, because the association would have its representatives at the market and would know which dealers were getting the best results with the same kind of goods; but at the same time it seems to me that the track selling should force a more dependable class of dealers. Where there is individual selling, or where there are a number of small competing associations, selling on track becomes very difficult because the buyer can not know that too many cars are not going to be sent into his market and he can not know that his competitor is not going to get fruit cheaper than he is buying.

(3) It often makes possible wholesale dealing. Fewer men may be needed to represent the buyers at the shipping points and often in case of apples, large sales are made by tender; that is, a bill of goods guaranteed to be of a certain standard can be sold to the buyer without inspection by his agent at the shipping point. The buyer is at less expense in making these deals and can deal on a narrower margin which of course means better prices to the grower without additional cost to the consumer. The fruit speculator and the small buyer can be eliminated partially at least with the same beneficial results. Pro-

fessor Crow of the Department of Agriculture of Ontario, speaking of the better prices received by the Norfolk Fruit Growers Association, says: "This is made possible by an improvement in grading and packing which otherwise would probably not take place at all, and also because of the fact that the small apple buyer has been entirely eliminated. The Association deals directly with some large buyer or distributing firm. This year the buyer of the Norfolk County pack is on the ground in that county directing the distribution of the crop over the Canadian Northwest, in the United States, and in the Old World markets."

Of course this larger wholesale method of dealing applies also to buying anything the growers will need, especially packing materials, spraying materials, and the like. Mr. Wilmeroth of the Rogue River Fruit and Produce Associations, says: "We are saving from ten to twenty per cent on our nails, boxes, paper and spraying materials." Mr. Campbell, manager of the Southern Texas Truck Growers Association, says: "Prior to the formation of this organization in 1906 our growers purchased their seed through various sources—regular seedsmen throughout the United States, speculators, and in some instances small dealers. The average price for the yellow seed (which composes from two-thirds to three-fourths of our crop) was $2.75 per pound, and the crystal wax averaged $4.00 per pound. In 1907 the writer made a trip to the Canary Islands and made a contract covering a period of five years, with a man whom we considered the most responsible grower of seed in the Islands. We pay eighty cents a pound for the yellow seed and one dollar a pound for the crystal wax."

(4) The association also is likely to get better service from the railroads, cold storage plant, etc., because of the larger business it controls. Then it is in a position to secure adjustments with the railroads and other larger concerns on points of disagreement, where the cost of litigation would make such adjustments impossible with the small grower. This is illustrated in a letter from Mr. Fleming, manager of the Georgia Fruit Exchange: "During the last shipping season, our Exchange was able to convince the transportation companies of the injustice of certain rates of freight on peaches from Georgia points to interior New York and Pennsylvania points, amounting to a difference of about $25.00 a car, and the lines admitted their rates were on the wrong basis, and corrected them by a new tariff, which went into effect on July 18th.

"Another benefit possible under co-operation can be pointed out in the case which has just been argued before the Interstate Commerce Commission at Washington, of the Georgia Fruit Exchange et al. vs.

Southern Railway et al.—a complaint against the minimum of peaches necessary to be loaded in refrigerator cars to obtain the freight rate, which, it is claimed is in excess of the carrying capacity of the car by about 87 crates, amounting to an excess transportation charge paid when the minimum is not shipped, of about forty-two or forty-three dollars per car, and, if the minimum is shipped, a damage to the fruit varying from one to two hundred dollars is encountered.

"This complaint against the minimum required by the roads has been a live issue for several years. One grower testified that he had paid freight in four years on 226 cars which were loaded under the minimum to the extent of about thirty-five to forty dollars per car, representing that he had practically paid $8,000.00 in freight and refrigeration charges to the transportation companies for fruit which had not been shipped—dead freight in other words—with the hope of bettering the condition of his fruit in the market. This grower was not able to institute a complaint before the Commission; no individual grower could have done it, but, through the agency of the Georgia Fruit Exchange, and at an expense which will no doubt amount to $3,000.00, this case has been presented and all testimony taken, and our attorneys feel very much encouraged at the situation since the testimony was heard. We hope for a favorable ruling the coming spring previous to the next shipping season.

"Should we be successful in getting a decision to the extent we requested, it means a quarter of a million dollars to be refunded to the growers of Georgia who shipped the 1910 crop. It is within the power of the Commission, in connection with such decision as they may render, to order reparation to the growers covering two years back, which, on 8,500 cars shipped in 1908 and 1909, would equal in round figures $340,000.00."

(5) Better business methods will prevail for the reason that very likely the best business man will be in charge of the association. Certainly better business men can be secured to manage the association because the larger business controlled will justify a salary that will buy the largest ability. Some of the best growers who understand their trees and the methods of care the best, are not the best adapted to dealing with men.

Making Use of Varieties of Fruits Grown in Small Quantities.—There are often varieties of fruits that are grown by individuals in such small quantities that without co-operation they are often wasted because no one man has enough to sell to advantage. With co-operation a car could often be loaded, and the fruit used to some profit to each grower. Often enough could be shipped each year to become known in the

market. This is especially important in the case of trying out new varieties. It is too great a risk for one individual to put out enough of a very promising new variety to market to good advantage. The same is true of fruits that are promising in a section but are not sufficiently tried in a commercial way. Thus, with table grapes in the Ozarks, the risk is too great for one man to grow enough to market to advantage except in small special markets. With an association handling other fruits each man could grow a small area and by marketing together, the prospects for profitable grape growing in the Ozarks could be effectively tried without danger of great loss to anyone.

Better Equipment for Handling the Crop in a Section.—Disorganized sections are less likely to have the necessary cold storage, pre-cooling and other equipment for the best handling of fruit crop. Thus, in Georgia, a government pre-cooling test for peaches is to be made through the agency of the Georgia Peach Exchange, and nearly all of the well organized sections are rapidly securing efficient equipment of this kind. This equipment often belongs to the association; but even private capital can better afford to invest in such facilities in an organized than a similarly located unorganized section. This is true because the business is nearly always in a more prosperous stable condition, and because they can have a more definite understanding about patronage since the association business generally goes as a unit.

Better Care of Orchards.—Co-operation also results in better care of the orchards. In fact, I think that this is the greatest of all the advantages in co-operation; but an association can not be held together for this alone. Mr. Johnson of the Norfolk Fruit Growers Association says that they have, by co-operation, increased the yield of their orchards to four or five times what it was before the association was organized, though the trees were then twenty years old. Professor J. W. Crow of the Ontario Agricultural Department says: "Production in Norfolk has increased from practically nothing to 37,000 barrels within less than ten years. A number of our other associations have begun operations in localities which have been producing for a number of years and in all cases increased production has followed the successful operation of a growers' selling agency." Everyone is acquainted with the excellent methods of the orchardists in the Northwest and in Colorado and co-operation prevails there to a very large extent. By co-operation the best growers, those who have either had more experience or have been in a position to get hold of the best methods, will influence the others so the methods practiced by the best growers will largely prevail in the entire association. Then the best methods will be discovered faster because they will result from the combined observation of all the growers.

Fig. 57. Press Room of the Gold Buckle Association of East Highland, California. As soon as the lids are nailed on the boxes they pass down the gravity roller system to be seen on the right to the Pre-Cooling Room shown in Figure 6. Thus the oranges are cooled at once to the temperature that checks the ripening process and makes it certain that they will reach the market in good condition. (Courtesy of Secretary R. B. Duyne.)

Fig. 58. Interior view of the pre-cooling room of the Gold Buckle Association of East Highland, California. Organized sections have been the first to take up pre-cooling, as they are nearly always first to make use of valuable new discoveries. (Courtesy of Secretary R. B. Duyne.)

The members too, are in a better state of mind to get hold of new information. Any discussion before the association is more effective because the members are in the habit of discussing measures and acting upon them. I have talked to meetings of associations and to public meetings organized by the institute work of the Board of Agriculture, and it was plain to see that the members of an association in a meeting are more likely to make use of any information they get than even the same men would be at a public meeting where the custom of holding discussions with the intention of acting upon them has not been established. Thus, members of a co-operative association more quickly make use of new discoveries, whether these discoveries are made by members of their association or by other growers and experimenters.

Not only will the methods of the best growers be adapted, but the methods generally adapted, especially diligence, etc., will be better in most cases because of the spirit of pride developed. When it is known that every man is depending upon the other fellow to keep up the good name of the association, the sense of honor will force a man to take care of his orchard just as it will force him to clean up his back yard in a city.

Greater Stability.—Owing to the rather frequent failures from frosts, glutted markets, disease, and insects, projects connected with the fruit business are often somewhat difficult to finance. Thus, while the cost of getting an orchard into bearing is generally greater than the value of the land, the young man of limited means can often borrow on it only in proportion to its value as general farm land. For the same reason it is often difficult to raise money for cold storage plants and other necessary equipment for a fruit section, except through somewhat shifty speculators and promoters. Co-operation tends to bring greater business stability to a section. This is almost uniformly the case in the localities where they have effective organizations. It is reflected in the land values which seem to be uniformly high without so much fluctuation in co-operative sections. Mr. W. C. Cullen of the Peninsula Produce Exchange, says: "The people have more confidence in our section, knowing that they are having the benefits and protection of an exchange. Land values are not only higher, but there is more stability and more strength in the present high prices than was the case when land was so much lower about six years ago." If I am correctly informed, the growers in the Grand Junction Fruit Growers Association have overcome obstacles in the past four or five years almost as great as those that have seriously crippled Missouri's fruit industry, and yet they have been prosperous. The great handicap to the orchardist is

the frost injury, and it is noteworthy that the fighting of frost by heating the orchards has become a custom first in an organized section. I have mentioned the large growth made by industries like the citrus fruit industry and the truck industry in Virginia and other points as the result of co-operation. Of course one of the main features of this will be the security that the members feel that they are going to get a square deal in selling their fruit, and the better methods and greater interest that have been instilled.

Then association naturally inspires confidence. If one boy were going home and his nearest road passed through a cemetery, he would probably go around, while five or six boys would go through, not because a ghost is necessarily awed by number, but first, because association with one's fellows gives a feeling of confidence, and, second, because you do not want your fellows to know that you are afraid. In the same way, if there is uncertainty as to venturing into a new method like spraying or heating the orchard, the very fact that other members of the association will likely do the thing would cause a man to do it when he would not, working alone; and the pressure of the others who expect him to keep up for the benefit of the association would have its influence also.

As we have seen above, co-operation makes possible the efficient small grower with ten to forty acres. This in itself will tend to increase the business stability of the community because these small growers are not in a position to give up the orchard on off years since they have everything tied up in it. Then they are in a better position to care for it on off years for they do it with their own labor at small expense, and are often able to largely support their families from parts of the farm not in orchard.

This encouraging the small grower and the greater business stability it brings to the community, will benefit the larger grower that may consider himself independent. It increases land values, makes financing projects easier, and social conditions in the community better. For this reason, if for no other, it seems to me he should lend his assistance to co-operative movements in his section.

DIFFICULTIES IN THE WAY OF CO-OPERATION.

Among the difficulties in the way of co-operation, may be mentioned:

(1) The fact that independent growers who do not help support the association get many of the benefits received by the members.

(2) The difficulty of keeping the quality of the goods handled

by the association as high as the quality of goods that would be handled by the best growers working independently.

(3) Crop failures that get the association out of working order on off years.

(4) A spirit of envy and lack of confidence and support of the managers by the members.

Benefits Without Paying for Them.—Possibly one of the greatest difficulties in the way of co-operation is the fact that the growers who are not members of the association get the benefits of the association without paying for them. This will be evident when we consider that one of the greatest functions of co-operation is proper distribution of the fruit, and if the association keeps the fruit out of the way there is little danger of the independent man's fruit going into a glutted market; or to put it in another way, suppose the association controls fifty per cent of the crop and sees that it does nŏt go into a glutted market, the chances for the independent fruit to go into a glutted market will certainly not be more than half as great, in fact will not be half as great, because the commission men to discourage co-operation will be more alert in keeping the fruit consigned from independents from going into glutted markets.

Further, the associations are generally able to hold up the price, because the commission men know that their competitors will not buy fruit cheaper than they do and they can, therefore, generally deal on a narrower margin. This, also, will benefit the independent men about as much as the members of the association. Then if an association puts up a good pack it will advertise not only the association, but the whole section in which the association is located. Thus, many people think not of the Hood River or Wenatchee association, but of the northwestern boxed apple; and the independents profit by the reputation the Hood River and Wenatchee honest pack has given that section.

Some members of the association who see that the independent men get as good returns as they do, will tend to drop out, thinking the association a failure; and independent men who would otherwise come into the association stay out because they are getting as much as the members of the association, and not seeing the reason, doubt the efficiency of co-operation.

Of course one remedy for this condition is to keep before the members the fact that the prices received by independents benefitting by the work of the association give no indication as to prices that would be received with the association out of the field. However, the more important remedy is to keep improving the pack so that the association

will receive better prices on account of its better goods and the confidence it inspires in the market.

The Difficulty of Keeping Up the Standard.—In any community the greatest source of strength will naturally be the best growers, but where the crop is pooled the prices will not be those that would be received by the best growers, but the prices for the average of the goods sold. Unless the association keeps constantly bringing up the quality of goods shipped, it will not be equal to that of the best growers and these will naturally tend to drop out, greatly weakening the association. No association can have a permanent success unless the standard of goods shipped is established by the best growers and unless this standard is maintained very rigidly.

Crop Failures.—With fruit, another great difficulty in the way of effective co-operation is the somewhat large number of crop failures, due to freezing, that are common in the fruit business. During the off years the association is likely to become disorganized. Then when there is a crop, the growers will tend to be more anxious to work in everything that will go, thus lowering the standard and reducing the value of the brand. However, with efficient organization they are more likely to resort to orchard heating, and give other care that will greatly reduce the number of off years. The difficulty is in getting efficiently organized before the off years break up the association.

Lack of Confidence and Loyalty to the Managers.—Possibly the most serious obstacle might be put in the language of the Reverend Washington Gladden: "We have not the co-operating man." We are accustomed to the competitive system and have not the training in pulling together for the common good to make co-operation as easily effective as it should be. Thus, members are loath to trust their officials; are over-critical; some make trouble over things not done according to theories they hold (often without careful reference to the actual conditions that confront the association), and in some cases elect their managers, etc., for their popularity rather than for their business ability and knowledge of the market. This has been the cause of failure of a number of associations.

In order to carry on its business, it is necessary for an association to have a capital stock. In some cases where there must be cold storage plants, etc., this may need to be rather large, and it may be necessary to let the dividend average as large or sometimes even larger than the legal rate of interest. And while it is best if the stock is all held by the fruit growers, it seems to be necessary sometimes to secure capital from other sources than the growers. This is especially true in growing sections where all the growers' money is needed to increase the

planting. These conditions make a good opening for smooth talkers with an ax to grind to go among the members and spread the opinion that the association is run to pay dividends to the stockholders and not in the interest of the growers.

Then the members may not tend to give the effective, loyal, support to the association that each man gives to his own business, and that is necessary for best results. Mr. A. N. Plank of Decatur, Arkansas, when advised not to go into a co-operative telephone scheme, since it did not amount to anything, answered: "It will amount to something if I go into it, for when I go into anything I stay with it." And for the best results this should be the spirit of each member of an association.

In my opinion, in every association a campaign of education should be carried on to let us see the advantage of co-operation and understand the duties devolving upon the individual members, and to keep us thinking about them, and to let us know at all times exactly what the problems of this particular association are. This seems to be effectively done by the Hood River Apple Growers Union and the Grand Junction Fruit Growers Association.

SUGGESTIVE CHARACTERISTICS OF SOME OF THE MORE SUCCESSFUL CO-OPERATIVE ORGANIZATIONS.

Capital Stock.—For an association to be successful there must be a capital stock, or the association becomes too much of a burden on the manager and directors. If there is no capital stock, the directors and manager, and often the manager alone, will be compelled to be responsible for the money necessary for various activities like guaranteeing the quality of the fruit, if this is done; buying boxes and other supplies; paying necessary laborers, representatives in the market, etc.; and in some cases providing cold storage facilities. Some associations even lend money to the growers for supplies until the crop is off. Of course the amount of the capital stock will depend on how many of these and other activities the association undertakes. The following is the capital stock of some of the well known associations in this country:

Grand Junction Fruit Growers Association.....	$200,000.00
California Fruit Exchange.....	100,000.00
Georgia Fruit Exchange.....	50,000.00
Rogue River Fruit & Produce Association.....	50,000.00
Surface Creek Fruit Growers Association.....	25,000.00
Eugene Fruit Growers Association.....	25,000.00
Southern Texas Truck Growers Association.....	10,000.00

British Columbia Fruit & Produce Exchange.....	10,000.00
Pomona Fruit Growers Exchange (subexchange of the California Fruit Growers Exchange).....	10,000.00
The Dalles Fruit Growers Association.....	5,000.00
Ozark Fruit Growers Association.....	2,000.00

The Manager.—The success of the association depends very largely upon the manager. In some cases the personality and industry of the manager alone are responsible both for the successful marketing of the crop and holding the growers together. It is evident that the manager should be a thoroughly well trained business man; a man with sufficient personality to command the respect not only of the trade, but of the members of the association to hold them together, and if possible, a man who has had experience in marketing fruit. Many associations secure commission men of long experience and of good reputation and this has often proved very successful. Since it is not an easy matter to secure a man that combines all the qualifications necessary in the manager of a successful association, it is evident that the best man should have the place whether he be a member of the association or not, and whether he live in one corner or another embraced by the association. No politics whatever should come into the election of a manager if the association is to accomplish anything. He should be paid a salary that will command his best services and make it unnecessary (and not to be thought of) that he will in any way use the association for his personal benefit other than for marketing his fruit, if he is a grower.

Size of the Association.—There is considerable disagreement as to how large an association should be. Especially is this true among commission men, as letters I have received indicate. A number of the commission men express the opinion that the small association would give a more harmonious working body of men and be able to raise the standard better than the large ones, while others express the opposite opinion. Mr. George G. Grupe of the Lagomarcino-Grupe Company, writes: "I believe in the small shipping association, but I believe more in the large shipping association. The larger the association, the better salaries it pays, and good salaries buy brains. The small association can not go to the expense necessary to keep thoroughly posted on all the different markets, and, therefore, in many cases ship blindly to some markets, and often depress a market, whereas, the big association would be better posted and would get in touch with the best commission merchants or jobbers in the different markets and be in position to market their products to the best advantage.

"I think that owing to co-operation or association among the growers, that the quality of fruit is improved, and the pack has improved very much. I believe that the association, large or small, that grows fruit intelligently, and packs it honestly, gets more for their fruit than the individual grower. And it has been my experience that the larger the association, the better results we could get, for it seems the more intelligent growers that associate themselves together, soon realize that by packing dishonestly they are not fooling the consumer of their products; they are only fooling themselves. Commercialism is responsible for a great many of the honest packs that are being put up today."

Mr. W. B. Geroe, a popular commission man, in an address before the National League Convention, said: "I never was a manager of any association of growers, but if I were the chair or the managership, I would connect up with every other manager in my section of the country, and establish a clearing house where somebody could parcel out the shipments intelligently, and not load to the guards one market that would have done right well with one-quarter of the quantity."

Generally speaking, I believe in the larger organizations. Of course it is possible for an association to handle products from too large an area, especially if the soil and climatic conditions should be so different that the quality of fruit of any given variety would be different. It might be a good method for an association to market products of the territory included in a single environment. Thus, it seems to me the strawberries of the Ozark section should be largely marketed together, because their quality and general characteristics would be very similar. The same might well be said of peaches and apples so long as a high grade pack is maintained. If the fruit or produce of a territory producing fruit containing certain common characteristics is marketed by a number of associations, the advantages of distribution, better controlling the market so that the selling agent may fix the price, etc., can not be realized by any of them. No association would know where the others are going to ship, so gluts could not be prevented. If there could be uniformity of pack among the different associations, bidding against each other would keep the growers from getting the full benefit of the reputation of that pack in the market. Then the larger the association, the more information about market conditions can be secured at the same cost to each individual and the better results the manager can secure through this increased knowledge. Since these constitute the principal advantages of co-operation, it is evident that growers could not be held together by a lot of small associations unless it should be with a crop where the one grower could not produce enough for carload shipments. If co-operation then is to be a success in the largest meas-

ure it must be through associations that control a good share of the output of a given section. At least they should control all the goods packed to a given standard in that section.

Mr. R. M. Hitt, in a paper before the Missouri State Horticultural Society, suggests a plan whereby all co-operative fruit and produce associations in the country would form a sort of general organization and supply one another with information about the conditions of the crop and render any other assistance to each other possible.

I do not wish to be understood as meaning to discourage a small number of growers from forming an association in a disorganized section. Such an association may be of great benefit to its members, especially in establishing a pack that will be sought in the markets. This is especially true with apples where a reputation for an honest pack is the most important factor in marketing.

Plan of Organization.—For a large organization to be successful, I believe that it must be made up like the Ozark Fruit Growers Association—of small compact local organizations where all the members can be brought together for discussion of the business of the association, the grading, etc. At least it is this type of association that has been most conspicuously successful. By far the largest organization of this type is the California Fruit Growers Exchange. It is made up of ninety-eight subassociations grouped into sixteen subexchanges. Each association elects a board of directors by stock vote, whose functions are to build packing houses, buy materials, employ a manager and other help, and generally direct the business of placing the fruit in the car ready for shipment. This board of directors also elects one or more representatives to the District Exchange, depending on the number of carloads of fruit produced by the association. These representatives to the District Exchange from the associations incorporate, generally with the smallest capital the law permits, then the representatives of each District Exchange elect a representative to the main Exchange and they incorporate as the California Fruit Growers Exchange. There is thus a system of leadership that reaches from the manager of the general Exchange down through the officers of the local exchanges and associations to the individual growers. It seems evident to me that the great number of members of the California Fruit Growers Exchange could not be held together and kept satisfied except through such a representative organization. If this fruit were handled by an exchange operating without subexchanges and associations, many of the growers could not be interested at the time of electing directors and would seem so far from the actual working of the association that they could not be made to understand it, and would tend to drop out. Besides, it would certainly

be impossible to keep up the standard of the pack without an organization like this that can, through officers of local associations, get in personal contract with individual growers.

Educational Features.—As previously mentioned, one of the greatest difficulties in the way of organization is the fact that most members have not acquired the co-operative way of thinking. For this reason a constant educational campaign should be made to keep the growers interested in co-operation, and to let them see the advantages from it and the obligations to the association from the individual members. The success of co-operative movements in any section in any line should be constantly held before the members, unless the association is working unusually well. In England, in Scotland, and in Ireland, there is what is known as "The Agricultural Organization Society," whose purpose is to foster co-operative enterprises among growers in all parts of the countries mentioned. In England "The Agricultural Organization Society" publishes a Journal entitled "Co-operation." In Denmark (where co-operation has possibly reached its greatest development) and in Germany and Italy there are similar societies, and in all cases co-operation has developed very rapidly in recent years. It seems to me that the different associations in this country would do well to unite in publishing a magazine of this kind, or in placing literature concerning the benefits of co-operation, as well as its difficulties, in other agricultural and horticultural publications. If some sort of a general organization of all co-operative associations in the country along the line suggested by Mr. Hitt could be effected, it certainly would be able to be of great value in educating us up to the most effective co-operation.

Co-operative Credit.—Mr. Charles Douglass in the "Transactions of the Highland and Agricultural Society of Scotland," Vol. 22, says: "The greatest practical obstacle in the way of agricultural organization is generally the difficulty of finance. A very large number of those who might benefit most by co-operation are prevented from taking advantof it because they deal on long credit with the merchants who supply them. It is this fact which has chiefly led to the development of co-operative credit as an essential adjunct to co-operative purchase. The agricultural credit banks, however, which play so large a part, especially in Germany and Italy, originated in the earlier movement pioneered by Schulze-Delitsch nearly seventy years ago for the promotion of popular Savings and Credit Banks. The later development of Raffeisen banks adapted the organization of the co-operative banks to the special needs of agriculture.

"The fundamental idea of the Raffeisen banks, which are the general model for co-operative credit in agriculture, is that the farmers in

a small area should combine to find credit for one another. They provide loans for approved reproductive purposes; and the banks rely for their success on the knowledge which their members and managers have of local circumstances, and of the character of the applicants, as well as on the fact that each member, being implicated with every transaction, has an interest in seeing that loans are only made for suitable purposes and to reliable persons. It is an interesting corroboration of the soundness of this principle that these banks do not in practice have any bad debts. Both in Germany and in Italy the banks are closely associated with purchasing societies, so that the borrower has the advantage not only of credit on reasonable terms, but also of co-operative purchase, and of the advice and guidance of those by whom the loan is sanctioned.

"It is not surprising that these banks should have come into existence wherever agricultural organization has had time to mature its influence, or that they should play a leading part, not only in Germany and Italy, but also in France, Denmark, Hungary and England. In Ireland they have come to occupy in recent years a widening field."

In this country the difficulty of securing funds often prevents the orchardist from giving his trees the proper care, which lack of care renders co-operation difficult. While banking conditions in this country are not the same as in others, and any system of credit would have to be adapted to American conditions, yet some system whereby members of the association who have to buy on credit can be aided in securing loans by the association with a careful system of inspection and under business-like rules, would unquestionably be a great benefit to co-operation in sections composed largely of small growers. In some of the organizations in this country the association furnishes packing supplies to the growers on credit. They are enabled to finance this through their capital stock though associations without a capital stock often secure loans for their members. Mr. J. B. Graves of the Neosho Fruit Growers & Shippers Association, says: "We are able to make arrangements with our strongest banks whereby the growers are accommodated with sufficient loans to buy their packages and pay their gathering expenses."

Association and the Commission Man.—While some commission men are unalterably opposed to co-operative movements, a great many are not. Many people get the idea that co-operative movements are uniformly antagonistic to the commission man. This is not true. Many of the associations feel that there should be co-operation not only among the growers, but also between the growers and the man who handles the fruit so as to reduce the risk to each as much as possible. It is probably true that in most cases the margin to the dealer will be made more narrow by co-operation, and it is probably true that in time co-operation

would tend to reduce the number of men necessary to handle fruit and produce. Whether it does or does not, it should tend to make the business of the commission man more desirable by giving him more honestly packed goods, reducing the risk from his competitor's under-buying him, and insuring him a more constant supply.

Should There be Competition for a Central Association.—Mr. J. B. Graves, business manager of the Neosho Fruit Growers and Shippers Association, speaking for the small independent associations, says: "They stimulate the large associations to do their best in the way of getting good prices. They serve as a spur to urge the big organizations forward. They want to beat the little fellows as perhaps they ought. So they do their utmost. It is humiliating to them to be beaten by an independent. They are helpful to each other in competing for a good price.

"They watch the larger associations so that they are more apt to be energetic, economical and incorruptible in their administration. If all the independents were to join the Ozark for example, who knows how much of a let-down there would be in activity, honesty and economy?

"It is a good thing to have some independent associations. There would be no way of telling whether the big association was doing as well as it might if there were no small associations in the same district with which to compare prices."

It is impossible to say how much truth there is in Mr. Graves' opinion. It is only fair to say that I have had this opinion expressed to me in letters from other men, though possibly not so forcibly. Co-operation is too new an activity for us to judge positively as to whether or not there would be a tendency to diminish honesty, industry and activity if one association controlled the entire output from a section. It must be admitted, however, that all successful associations have had to deal with competition, though this is in no sense proof that they would not have been efficient without competition. This may be said of any particular section like the Ozarks, however, that even if all the growers in that community were shipping through one central association, there would be competition with other sections; and this would afford some means of testing the efficiency of the general organization, though of course not a sure means. I believe frankly that where an association is working as efficiently as the Ozark Fruit Growers Association, it should have practically the unanimous support of the growers in the section it covers, so long as the standard of its pack is equal to the best put up by any independent growers in the section, and its average net prices

throughout a season are not excelled by the average net prices of any independent association.

Is a Central Marketing Association a Trust?—Whether or not a large central marketing association is a trust within the meaning of the law, of course, is not for me to discuss. However, it is unquestionably true that the effects of co-operative associations have been to give the consumers a study supply of fruit or produce at a reasonable price. Generally the only means by which the price is raised to the consumer are by properly distributing the crop so as to prevent gluts and by improving the quality of goods sold. It is evident that if a consumer is buying fruit or produce very cheaply on account of a glutted market when the glutting could be prevented by distribution, some other market is not securing all of this product it wants, and is having to pay more than it should pay. Improvement in quality, the consumer is always only too glad to pay for. The effect then of co-operation to the consumer is to give him a more uniform supply of fruit or produce of a better quality. It gives a more uniform supply not only because of proper distribution, but because it greatly stimulates the industry and secures better methods in growing and a greatly increased output. The influence of the Norfolk Fruit Growers Association, previously cited, where the yield of the trees was increased four or five times through the stimulus of co-operation, is an example. The great increase in the potato and sweet potato industry through the Eastern Shore of Virginia Association may be cited as another. By far the most effective co-operation is with citrus fruit in California and yet in spite of great obstacles to the grower, the consumer is remarkably well supplied with oranges and lemons at a very reasonably price. So far as my information goes, the effect of trusts in other lines is generally to crowd the small man out. The opposite is true with co-operation. It is almost the only possible means by which the small grower can stay in business, except to supply a nearby local market. With such benefits accruing to both the grower and the consumer (and therefore the public generally), it would not seem probable that the law would seek to hamper co-operation. It may be said too, that in a number of countries, co-operation is fostered by the government.

Co-operation and Rural Social Life.—While as mentioned above, co-operation as applied to rural activities is too new to permit of definite conclusions as to certain indirect influences, so far as we can judge, however, it seems to aid in solving some of the troublesome rural problems, and in bringing a condition of contentedness among the growers. Professor J. W. Crow of the Ontario Agricultural College, says: "With regard to the secondary results brought about by co-operative action, I

may say that these are several in number and decidedly far-reaching in their effects. Increased price and increased crops spell, of course larger profits, and under the influence of the increased returns made from apple orchards, a large increase in acreage has been made within the last three or four years. It is probably safe to say that the planting of apple trees in Norfolk county is now in excess of thirty thousand yearly.

"This increased interest in orcharding has been somewhat of the nature of a boom, and land values have increased accordingly. Mr. Johnston tells me that land close to the town of Simcoe and desirable in every way for apple growing, which was formerly valued at $40.00 an acre is now actually changing hands at from $100.00 to $110.00 per acre. This, of course, is bare land without fruit. This rise in the value of land is due, of course, to the fact that growers are being attracted to the district, which means an immediate addition to the population of the country. To us in Ontario, this is a particularly important feature, as our agricultural population has been for some years decreasing in numbers, owing to migration to cities and to the new lands of the Canadian Northwest." This increased rural activity is not due to special climatic advantages of the Norfolk district, since the fruit industry and the rural population are declining in equally favored districts where co-operation has not secured a footing.

Mr. Charles Douglass, in "Transactions of the Highland and Agricultural Society of Scotland," Vol. 22, says, after mentioning the financial effect of co-operation: "Not less real, and not less important in its ultimate result, is the social influence of co-operation. Its effect in other countries has been to stimulate and revive rural life on its social no less than on its economic side, and to check the drift towards the towns, which is largely due to the decline of social relations in the country."

Co-operation, then, unquestionably tends to keep the growers on the farm and to keep up rural population. The public institutions and general rural life are apparently better, at least in many of the co-operative centers. It would seem probable that when the growers are in the habit of meeting and discussing problems and acting upon them, they would apply the same business-like methods in meeting social problems much more effectively than under the average disorganized system when the tendency is to do a lot of talking and practically no acting upon it. Of course co-operative societies purely for the purpose of bettering social conditions on the farm should be encouraged and in many places could be organized where co-operation in any other line would be difficult, if not inadvisable under present conditions.

RECOMMENDATIONS FOR MISSOURI.

Let us apply some of what has been said above to Missouri conditions.

Peaches.—The peach business has largely centered itself at Koshkonong, and as it is further developed it will probably remain in a few of the more favored sections mainly in the extreme southern part of the state. At Koshkonong, as mentioned above, there is organized a fruit growers association to handle peaches, that seems to be very ably managed, and in my opinion it should certainly have the support of all the growers in that section. In parts of Arkansas the Ozark Fruit Growers Asociation is very successfully handling the crop. If other apparently favored sections are developed in the peach business they will naturally tend to follow the example of Koshkonong and these Arkansas sections, and we should expect to see Missouri become well organized so far as peaches are concerned.

Strawberries.—In the strawberry business the Ozark Fruit Growers Association is certainly filling its purposes admirably. It is gradually improving the quality of berries sent out; is working to have uniform boxes and a uniformity of varieties, and I hope and expect to see it successful in establishing so high a reputation for its brand, that on account of its better prices it will receive a more general support in the strawberry business than it now gets. It, also, should have the loyal support of everyone interested in seeing the strawberry business thrive in all parts of Missouri where strawberry growing is the most paying industry.

Apples.—With the apple business, however, the state is hardly so fortunate. It is true that except in very heavy crop years apples are generally marketed for as much as they are worth, considering the pack, etc.; that is, the question of distribution, except in seasons like 1906, does not seem to be a serious one. It is more a question of establishing a brand that will carry weight in the market. I do not believe that a co-operative association can be held together merely to distribute an apple crop, for in most cases the advantages of the association would probably not be apparent and the growers would not support it. For this reason I seriously doubt if an association for marketing apples that begins on a large scale can succeed. The following from Mr. A. McNeil, Chief of the Fruit Division of the Dairy and Cold Storage Commission of Canada, speaking of the Annapolis and Cornwallis Valleys in Nova Scotia, is suggestive: "In years gone by there were attempts at union among the fruit growers; they all failed, partly for one reason and

partly for another. One mistake was starting too elaborate a scheme. The ideal, of course, would be to have the whole Valley organized; practically, this was impossible at first. * * * Three years ago a few fruit growers united in the neighborhood of Berwick, about the center of the Valley. They devoted themselves to improving their product; made it a condition that the members should spray their fruit and should ship it all through the association. This improvement alone directed the attention of the speculators, and the extra quality of their fruit and the large quantity of it aggregated at one point, enabled this association—small though it was compared with the whole Valley—to command a high price for their apples. This led the next year and last year, to the formation of three other associations and to the strengthening of the original association. The results have been most satisfactory, and I believe that the problem is in a fair way of being solved." It would seem probable that in Missouri the more desirable method of starting would be for small associations, possibly fostered by the Ozark, if the management of that association should so desire, to be formed with a few trained packers and fruit carefully graded into grades that will be maintained from year to year, if possible, as carefully as they are in the Northwest. This does not necessarily mean that all the grades should be put up in as expensive a manner so that fruit will have to be sold at as high a price. It does mean that the standard will be maintained as honestly so that the business value of a good reputation will be secured. And I believe that with as good methods, Missouri can grow fruit that is of finer quality, and of as good color and appearance as any in the Northwest, and a good percentage of any year's crop should be packed to go on to a fancy fruit market. I do not believe that this would reduce the amount of fruit sold in the common grades for the people that must have fruit at a reasonable price, because the better profits to be obtained from the well graded fruit will stimulate the growers to better methods and to heating their orchards. The result of this would be that the seventy per cent say that is not put into a fancy package would amount to much more than the entire crop under present methods.

If such an organization, or group of organizations, should be prosperous, and I certainly believe they would, it would seem that their influence would grow and that all the growers in the country surrounding would tend to come into the association and give their orchards all the care the results justify. Then as the prosperity of these sections becomes known, new growers coming into the state would tend to gather around these centers so that eventually the Missouri orchard industry would tend to become centered in the most favored sections. This, it seems to

me, is much to be desired. As these initial organizations become prosperous, others in favored sections would be formed, and all should be fostered by one central marketing association with a sufficient number of trained packing foremen with uniform ideals who would see that the standard is the same for each section. As a man who is interested in seeing the Missouri fruit industry prosper and who is trying to be an Ozark fruit grower, I should like to see all of this work done under the Ozark Fruit Growers Association, so far as the Ozarks are concerned. I see no reason why such a compact association would not have the same influence in bringing in new growers; in bringing up in a more stable way the real estate values and general stability of the Ozark section that similar associations have had in the Norfolk and other co-operating districts.

New Plantings.—Sections now being planted, should organize at the beginning and have some understanding as to varieties to plant. This should secure a more reliable list of varieties. It should also make it easier to try out promising new varieties and get them on the market to a good advantage without anyone man's risking too much on them. It should also enable a section to try out the summer apple business.

Summer Apples.—I believe (from experience of some growers in this state and a considerable number of them in Illinois and further east) that summer apple growing could well be encouraged, especially in extreme South Missouri. Yet it is to some extent a new industry here and it would therefore be somewhat hazardous for single individuals of limited means to grow enough for frequent carload shipments. Then summer apples are more perishable and if enough should come to be grown to supply the markets, there would be nearly the same danger from loss in glutted markets than there is with peaches and strawberries unless there is co-operation.

The Ingram Apple.—On account of the late blooming which makes it less liable to frost injury, the Ingram apple should probably be planted the most extensively of any variety we now have in Missouri. Yet there is no variety of apple where co-operation to secure severely rigid grading is more needed. The trees tend to over-bear, and the apples to be small. Then under some conditions the color is poor and the skin harsh and disagreeable. Without co-operation, a large quantity of these culls would go on the market with apples that should go in better grades, especially on years like the past two or three when the market is good for any kind of apple. This would tend to injure the standing of the Ingram in the market. Yet when carefully culled it is an apple of good appearance and high quality. These combined with its unusually good keeping qualities should make it an excellent market apple when prop-

erly graded apples are offered in large enough quantities to impress the market. For the Ingram then to reach its proper place in the market, it must be severely graded and the standard adhered to every year regardless of the condition of the market. Further, enough of each grade must be offered under a single brand through a single agency to become well known in the markets.

Grapes. Some of the best fruit men in the state think good money could be made from table grapes. They are rather certain in cropping and seem to bring a good price at the season when South Missouri grapes would be ripe. Nevertheless they are not well tried out in this section, and it would hardly be advisable for one grower of limited means to test them for growing in sufficient quantities to ship in car lots. They can be tested safely only through co-operation in centers like we have in the strawberry business where each man grows only small quantities but enough men have them in small quantities that all together can ship in car lots. It is doubtful if grapes should be the only crop grown in any center in Missouri, but they could well be associated with peach, summer apple, and strawberry growing.

The St. Joseph Section.—In the apple business, it seems to me there is no section where greater benefits would come from co-operation than in the region around St. Joseph. If there were an effective marketing organization there that required the growers to spray and give their orchards good care, I can see no reason why that should not become as important an apple section as any in the country.

Co-operation in Other Lines of Agriculture.—This paper has dealt with the advantages of co-operation for the fruit grower. It should be said, however, that co-operation has been practically as successful in other lines of agriculture. In Denmark, co-operation has reached a high degree of perfection with bacon, dairy products and poultry. In nearly all of the European countries, co-operative dairying is in some sections meeting with marked success; the quality of the products sold being improved and the price thus increased, while the cost of supplies, etc., by wholesale purchase is reduced. In the case of poultry, practically every benefit that applies to co-operation in fruit growing, also applies to the poultry business. Supplies can be bought cheaper; better prices can be secured for eggs and other poultry products through a careful system of grading and getting them to market rapidly. The cost of marketing can be reduced because poultry products are generally sold in quantities too small for single individuals to look after the entire marketing profitably. Further, the growers need the stimulus of association with each other to tide them over hard years as they do in the

case of fruit growing. Mr. T. E. Quisenberry, Secretary of the State Poultry Board, is preparing a constitution and by-laws and getting ready information for sections that choose to co-operate with their poultry, following the example of one or two very successful poultry communities in this State. While the poultry industry seems to offer considerable in the way of profit, especially as a side-line to other phases of agriculture, I firmly believe that it can not hope to be built up to its greatest possibilities, especially in the Ozark section, without the stimulus of co-operation.

Acknowledgements.—The conclusions in this paper are made up from letters received from 216 commission men, independent growers, members and managers of associations, and officials in this and other states and countries. I wish to express my obligations to every man who furnished information.

ORGANIZING AN ASSOCIATION.

The method of procedure in organizing an association will vary, of course, with local conditions. Generally the man who is taking the lead should get a meeting called six or eight months before marketing time.

It is best if a strong man from some successful association where local conditions are similar, can be secured to explain the advantages, difficulties and best method of procedure of an association from his experience. It will be necessary generally to elect a president, secretary and board of directors. Great care should be exercised in choosing these directors for they should choose the manager.

A contract binding every member to ship through an association should be signed. If the association is large enough to justify it, it should be incorporated. In this case, an attorney should generally be consulted.

It is necessary to have a constitution and by-laws, and the following are copies adapted to various conditions:

CONSTITUTION AND BY-LAWS OF THE GRAND JUNCTION FRUIT GROWERS' ASSOCIATION.

I.

The name of the said association shall be the Grand Junction Fruit Growers' Association.

II.

The objects for which the said association is created are to buy and sell fruits, vegetables, hogs, meat, stock and all the products of Mesa county, both fresh and manufactured; to erect, operate and maintain canning and packing factories and commission houses; to manufacture any and all products of Mesa

county; to lease, mortgage and sell said business, and to borrow money for carrying on the same, and to pledge their property and franchise for such purposes. To acquire by purchase or otherwise and own real estate, buildings, machinery and all the necessary power and power plants for carrying on said premises, and to lease, mortgage and sell the same.

III.

The term of existence of said association shall be twenty years.

IV.

The capital stock of the said association shall be twenty-five thousand dollars, divided into five thousand shares of five dollars each.

V.

The number of directors of said association shall be seven, and the names of those who shall manage the affairs of the association for the first year of its existence are C. W. Steele, A. A. Miller, J. W. Rose, R. W. Shropshire, J. H. Smith, P. A. Rice and A. B Hoyt.

VI.

The principal office of said association shall be kept at Grand Junction, in the said county, and the principal business of said association shall be carried on in said county of Mesa.

VII.

The stock of said association shall be non-assessable.

VIII.

The directors shall have power to make such prudential by-laws as they may deem proper for the management of the affairs of the association, not inconsistent with the laws of this State, for the purpose of carrying on all kinds of business within the objects and purposes of the association.

BY-LAWS.

Article I.

Section 1. The board of directors, provided for in the articles of incorporation of this association, shall be elected annually at the regular annual meeting of the stockholders, as hereinafter provided, and shall hold their offices until their successors are elected and qualified.

Sec. 2. Said directors shall be stockholders in said association and shall be fruit growers in Grand Valley, and shall be residents of Mesa county, Colorado.

Sec. 3. Any vacancy occurring in the board of directors shall be filled by the remaining members of the board.

Article II.

Section 1. The board of directors shall, as soon as may be after their election, elect a president and vice-president from among their number, who shall hold their offices for one year, and at said meeting the said board shall

appoint a secretary, treasurer and manager, who shall be subject to removal at any time.

Sec. 2. The secretary, treasurer and manager shall each, when required by the board, give bond in such sum and with such security as the directors may require, conditioned on the faithful performance of their duties, and to turn over to their successors in office all books, papers, vouchers, money, funds and property of whatever kind or nature belonging to the association, upon the expiration of their respective terms of office, or upon their being removed therefrom, or with such other conditions as may be proper.

Sec. 3. The president shall preside at all meetings of the directors or stockholders. He shall sign as president all certificates of stock, and all other contracts and other instruments in writing, which may have been ordered by the board of directors.

Sec. 4. The vice-president shall, in the absence of or disability of the president, perform his duties.

Sec. 5. The manager shall have full charge of the commercial and shipping department of the association. He shall receive all money arising from the sale of fruit and other commodities handled by the association, and pay the same to the parties entitled thereto, and render a true account thereof; and he shall also be the treasurer of this association, and safely keep all money belonging to the association, and disburse the same under the direction of the board of directors, except as hereinabove set forth.

Sec. 6. The secretary shall keep a record of the proceedings of the board of directors and also of the meetings of the stockholders. He shall also keep a book of blank certificates of stock, fill up and countersign all certificates issued, and make the corresponding entries upon the marginal stub of each certificate issued. He shall keep a stock ledger in due form, showing the number of shares issued to and transferred by any stockholder and date of issuance and transfer. He shall have charge of the corporate seal and affix the same to all instruments requiring a seal. He shall keep, in the manner prescribed by the board of directors, all accounts of the association with its stockholders, in books provided for such purpose. He shall discharge such other duties as pertain to his office and as may be prescribed by the board of directors.

Sec. 7. These by-laws may be amended by the board of directors at any special meeting thereof called for that purpose, a notice of such proposed amendment being given in the call for such special meeting.

Article III.

Section 1. The regular meetings of the board of directors shall be held at the office of the company on the first (1st) day of each month, except when the first day comes on Sunday or legal holiday, then on the following day.

Special meetings of the board of directors may be called by the president, when he may deem it expedient or necessary, or by the secretary, upon the request of any three members of said board.

Sec. 2. A majority of the board of directors shall constitute a quorum for the transaction of business, but a less number may adjourn from day to day upon giving notice to absent members of the said board of such adjournment.

Sec. 3. The board of directors shall have power:

First—To call special meetings of the stockholders whenever they deem it necessary, by publishing a notice of such meeting once a week for two weeks next preceding such meeting in some newspaper published in Grand Junction, Colorado.

Second—To appoint and remove at pleasure all employes and agents of the association, prescribe their duties, where the same have not been prescribed by the by-laws of the association, fix their compensation, and when they deem it necessary, to require security for the faithful performance of their respective duties.

Third—To make such rules and regulations not inconsistent with the laws of the State of Colorado, the articles of incorporation or the by-laws of the association, for the guidance of the officers and the management of the affairs of the association.

Fourth—To incur such indebtedness as they may deem necessary for carrying out the objects and purposes of the association, and to authorize the president and secretary to make the note of the association with which to raise money to pay such indebtedness.

Sec. 4. It shall be the duty of the board of directors:

First—To be caused to be kept a complete record of all their meetings and acts, and also the proceedings of the stockholders, present full statements at the regular annual meetings of the stockholders, showing in detail the assets and liabilities of the association and the condition of its affairs in general.

Second—To supervise all the acts of the officers and employes, require the secretary, treasurer and manager to keep full and accurate books of accounts of their respective business.

Article IV.

Section 1. At the regular meeting in the month of January of each year the directors shall declare such dividends upon the capital stock to all the stockholders then appearing of record as may be warranted by the net earnings of the association for the preceding year.

Article V.

Section 1. The board of directors may, whenever they shall deem it necessary, place on sale so much of the capital stock of the association as may be necessary to raise funds for the purpose of carrying out the objects and purposes of the organization of the association, such stock to be sold only upon the following conditions:

First—That not more than three hundred (300) shares thereof be sold to any one person, firm or association of persons.

Second—That such stock be sold only to fruit growers in Grand Valley

Third—That such stock be sold at not less than par value of five (5) dollars per share.

Article VI.

Section 1. The annual meeting of the stockholders for the election of directors shall be held on the third (3rd) Saturday in January of each year, but if for any reason it should not be held on such day, it may then be held on any day subsequent thereto, as hereinafter provided.

Sec. 2. The board of directors shall be elected by the stockholders at the regular annual meeting. Public notice of the time and place of holding such annual meeting and election shall be published not less than ten (10) days previous thereto, in some newspaper of general circulation printed in Grand Junction, and the said election shall be made by such of the stockholders as shall attend for that purpose, either in person or proxy, provided a majority of the outstanding stock is represented. If a majority of the outstanding stock shall not be represented, such meeting may be adjourned by the stockholders

present for a period not exceeding sixty (60) days. All elections shall be by ballot, and each stockholder shall be entitled to as many votes as he or she owns shares of stock in said association: Provided, however, that no person who is not himself a stockholder shall be allowed to represent by proxy any stockholder in the said association.

The persons receiving the greatest number of votes shall be the directors for the ensuing year, and until their successors are elected and qualified.

Article VII.

Section 1. Certificates of stock may be transferred at any time by the holders thereof, or by attorney in fact or legal representative. Such transfer shall be made by endorsement on the certificate of stock and surrender of the same: Provided, such transfer shall not be valid until the same shall have been noted in the proper form on the books of the association. The surrendered certificates shall be cancelled before a new certificate in lieu thereof shall be issued, and no transfer of any share of stock shall be valid or allowed upon the book of the association upon which any deferred payments are due and unpaid, nor which has not been sold and transferred in accordance with the provisions of the by-laws of the association.

Sec. 2. Any stockholder desiring to dispose of his stock in said association shall deposit the same with the secretary of the association, and the same shall be sold by the said secretary at not less than par for account of such stockholder within sixty (60) days from date of such deposit, under the restrictions of section 1, article 5 of these by-laws: Provided, that if the secretary shall not have sold such stock at the expiration of sixty days, then such stock may be returned to such stockholder and be disposed of by him without restriction or limitation by the association.

Article VIII.

Section 1. All members of this association are required to market all their fruit through the association and bear their proportionate share of the expenses of handling the same.

Sec. 2. Any member may have the privilege of selling his own fruit at the orchard, but no sales of fruit shall be made to a dealer in fruit or to any person who buys to ship outside the county. In case of the sale of the entire crop of any particular fruit or fruits, by reporting the same to the association, one-half (½) only of the regular commission will be charged.

Sec. 3. Any member having any grievance or cause of complaint as to treatment of his fruit by the association can appeal to the board of directors, whose decision shall be final.

Sec. 4. All members must pack their fruit for shipping in a neat and workman-like manner, and pack the same in standard sized packages, as adopted and in general use by the association, having placed thereon their name or number.

Article IX.

Section 1. A purchaser of stock in this, the Grand Junction Fruit Growers' Association, shall hereafter receive of the profits of the association in proportion to the money he has invested.

CONSTITUTION AND BY-LAWS OF THE EASTERN SHORE OF VIRGINIA PRODUCE EXCHANGE.

Article 1. Name—Object.

Section 1. This association shall be known as the Eastern Shore of Virginia Produce Exchange.

Sec. 2. Its object shall be the buying, selling and handling of produce; the selling and consigning of produce as agent of the producer; the inspection of all produce so sold or consigned, and the owning or operating of storage warehouses and packing houses for produce.

Article 2. Officers.

The officers of this exchange shall consist of a president, vice-president, secretary, treasurer, general manager, general inspector, assistant secretary, assistant treasurer, assistant general manager and a board of directors. There shall be also local boards, local inspectors and local agents.

Article 3. Term of Office, etc.

Section 1. The term of office, in all cases, shall be for one year, viz.: from January 1st to December 31st, unless the office be otherwise declared vacant; but the tenure of any officer shall continue until his successor has been duly elected or appointed, as hereinafter provided.

Sec. 2. One person may hold two offices, if elected thereto.

Article 4. Duties of Officers.

Section 1. The president shall call all meetings of the stockholders and the board of directors, and preside over the same. He shall exercise a general supervision of the affairs of the exchange, and perform such other duties as may be imposed upon him by the constitution and by-laws.

Sec. 2. In the absence of the president, the vice-president shall perform the duties of that office.

Sec. 3. The secretary shall keep the minutes of all the proceedings, whether of the meetings of the stockholders, board of directors or such other records as they may prescribe. He shall also conduct the correspondence of the exchange.

Sec. 4. The treasurer shall receive and be the custodian of all funds properly belonging to the exchange. He shall pay all salaried officers, agents and employes, and all debts due by the exchange, as directed by the board of directors. It shall be the duty of the treasurer to receive daily from the business manager the reports from the local agents, and to preserve the same for future reference, and to require from all commission merchants doing business with said exchange a statement of all business transacted with them through the exchange at such times as he may deem advisable. He shall keep the financial records of the exchange in business order, and his books be at all times open for the inspection of its officers and stockholders. He shall report to the general manager all buyers who, in his judgment, have not met their obligations, or to whom he thinks it inadvisable to extend further credit, and then the general manager shall not sell to said derelict buyer or buyers

until the same have been satisfactorily adjusted, nor shall he sell to any party against the recommendation of the treasurer. He shall give bond for an amount to be named by the board of directors.

Sec. 5. The general manager shall manage all produce placed in the custody of the exchange, whether for consignment, sale or storage; and under the authority of the board of directors shall buy, sell, consign or store any such produce. It shall also be his duty to advise local agents to whom to consign produce placed in the hands of the exchange; to notify local agents every morning the prices at which goods from his station were sold on the day previous, and to see that such information is disseminated among members of the exchange at the various shipping points; and he shall also transmit daily reports from local agents to the treasurer in accordance with section 4, article 4. He shall at all times endeavor to see that goods are properly inspected, and when information reaches him of any delinquency in inspection on the part of any local inspectors, he shall at once, either personally or through the general inspector, see that said delinquency is corrected. Said general manager shall also keep a record of the total number of packages of goods shipped each day from each shipping point in books prepared for that purpose. And he shall report to each meeting of the board of directors each failure on the part of the local agents to report to him, or mail to the consignee daily invoice in accordance with section 10, article 4. He is hereby empowered and it shall be his duty, for good cause, to suspend any local agent or inspector until the next meeting of the board of directors. And upon such suspension he shall notify in writing the local agent or inspector so suspended of the grounds of his suspension, and require him to appear before the board of directors at their next meeting, to show cause why he should not be suspended from office. Upon any such suspension, the general manager is further empowered to appoint someone to fill the vacancy created by such suspension until such agent or inspector has been reinstated or his successor duly elected. And further, he shall perform such other duties as may be imposed upon him by the board of directors.

Sec. 6. The general inspector shall supervise and direct the local inspectors at each shipping point as to the method of inspecting, grading and packing all produce to be handled by the exchange; and shall see that the standard shall be maintained as near uniform as may be, both as to grade and package; and shall report any delinquency or malfeasance in office on the part of any local inspector directly to the president. He shall further ascertain, as far as possible, all persons, whether manufacturers or purchasers of packages under the standard size, and see that they are prosecuted for manufacturing, dealing in, purchasing or using same. Said general inspector shall visit each local point not less than once a month and at such other times and places as he may be directed by the general manager. He shall also report regularly to the board of directors.

Sec. 7. The board of directors shall have the full management of the active business of the exchange. They shall authorize the method of inspecting produce, and the choice of markets to which produce may be shipped. They shall fix the salaries of all officers, inspectors, agents and employes. They shall have authority to remove any officer or employe for cause, and shall fill any vacancy in such offices temporarily by appointment until filled by the stockholders, or local board, as the case may be.

Sec. 8. The duties of officers of local exchanges shall be as follows: Local boards shall look after the interests of the exchange in their particular neighborhood, use all their influence to induce growers of produce and land owners

to take out stock in the exchange, and report to the superior officers of the exchange any defects apparent to them in the management of the business of the exchange.

Sec. 9. Each local agent shall report daily to the general manager all shipments made by his station on that day, the names of parties shipping, the number of packages and to whom consigned or sold; said reports to be made in such manner as the general manager may prescribe. Local agents shall receive the produce from its members and their tenants and mark same with initials of grower on each package, after the same have been inspected and branded, and notify the general manager of the number and kind of packages which he has for disposition. The local agent shall, if the general manager directs the produce to be consigned, mail to the consignee an invoice of the number of barrels or packages consigned, together with the names of the persons who have furnished the produce, their respective postoffice addresses and the number of packages each person has in the consignment, and the consignee shall make separate returns to each of such persons, after deducting three per cent. (3%) for the exchange, which three per cent. (3%) the consignee shall send to the treasurer of the exchange with a full statement of the source from which it arises. Said local agent shall keep an accurate record of all produce received by him, the date on which it was received, the disposition made of same, whether sold or consigned, and if sold, at what price, and when the returns for said goods were received from the secretary and treasurer of the exchange and when paid to the shipper; said records to be kept in a book to be furnished by the general office and shall be open at all times to the shipper for his inspection, and further, the said local agent shall produce said book for the inspection, examination and verification by any individual sent out from the general office. Said local agent shall deposit all funds received by him from the exchange in some bank to his credit as agent for said exchange, and shall immediately, after receiving payment from the general office, pay the same over to the party entitled to same and enter the price and date of payment in the book above provided for. No local agent shall be permitted to buy for shipment or sale, and satisfactory proof of said agents' buying for shipment or sale shall be deemed sufficient cause for suspension or removal.

Sec. 10. Local inspectors shall be appointed by the board of directors, and shall receive the produce from its members or their tenants, bringing the same to the exchange for disposition, inspect, grade and brand it according to the directions received from the general office. No local inspector shall be permitted to buy for shipment or sale, and satisfactory proof of said inspector's buying for shipment or sale shall be deemed sufficient cause for suspension or removal.

Article 5. Elections and Appointments.

Section 1. The president, vice-president, secretary, treasurer, general manager and general inspector shall be elected annually at a regular meeting of the stockholders, and without reference to the shipping point to which they may be attached. The assistant secretary, assistant treasurer and assistant general manager shall be appointed by the board of directors. Each member of the board of directors shall be selected by the respective local exchange he may be chosen to represent; but said local must be in good standing, its membership shall be twenty (20) or more, and shall represent not less than two hundred and fifty dollars ($250.00) of the capital stock of the exchange:

Provided, however, that this section shall not affect existing organizations with a membership of less than twenty (20).

Sec. 2. As to local agents and local boards. Local agents shall be elected by the stockholders attached to the shipping points where they are to serve; and said stockholders shall also have the power to remove said agents for cause and to fill any vacancies so occasioned, but said local agents shall be subject to the approval of the board of directors of the exchange, and said board of directors shall have the power to remove them, fill the vacancy temporarily and call at once for a new appointment by the local stockholders attached to that shipping point. Every stockholder shall register himself with the secretary of the exchange at his nearest shipping point; if he be not a shipper, then at the point nearest his residence, unless he be a farm owner, in which case he shall register at the shipping point nearest his farm; if he be a non-resident and not an owner of farm land, then he shall be registered at the general office and not be permitted to vote in the local divisions; but if he be a farm owner, then at the point nearest his farm: Provided, however, that this section shall not apply to Pungoteague and Craddockville divisions as they at present exist. All stockholders from the various shipping points shall annually elect a local board of five (5) stockholders from among themselves for that shipping point, and when they so elect the local board, they shall at the same time designate one member of the local board as a director of the exchange, the board of directors thus being composed of as many directors as there are local boards.

Sec. 3. New divisions, how organized. Whenever twenty (20) or more stockholders, representing not less than two hundred and fifty dollars ($250.00) of the stock of the exchange, shall desire to organize a new division, they shall first make application to the board of directors for permission to so organize a separate division, and if the said board of directors shall give consent, then the said stockholders shall, as soon thereafter as possible, meet and organize by electing their local board of directors and agent, and designate one of the members of their local board to act as a member of the board of directors. The secretary of said local division shall forthwith notify the general office of the organization of said division, the name of member designated to act as a member of the board of directors and agent: Provided, however, the board of directors shall not give consent to the organization of a new division whenever in its judgment some other organization or organizations will be reduced by the withdrawal of members who will unite with the new division to less than twenty (20) members, representing at least two hundred and fifty dollars ($250.00) worth of stock.

Article 6. Meetings.

Section 1. A regular meeting of the stockholders shall be called annually at such time and place as the president or board of directors may direct. The president may call a special meeting at any time after due notice has been given.

Sec. 2. Regular meetings of the board of directors shall be held quarterly at such time and place as may be designated by the president. He may also call special meetings of said board whenever in his judgment, or that of a majority of the board, it may be deemed necessary.

Sec. 3. Local exchanges may fix their own times and places of meeting, except the annual meeting for the election of officers, which shall be at such time as the board of directors shall prescribe, but the representatives of each

local chosen to serve as a director must be certified to the secretary of the exchange within five days from the date of all such local meetings.

Article 7. Franchises, etc.

Each stockholder shall be entitled to one vote for each share of stock held; but no person shall be allowed to hold more than ten per centum of the whole number of outstanding shares.

Article 8. Brand.

Section 1. One or more regular brands shall be adopted by the exchange for the marking of produce handled by it, and a copyright or copyrights obtained therefor.

Sec. 2. All packages for shipment through the exchange, after being inspected and graded, shall be labeled Eastern Shore of Virginia Produce Exchange, and if No. 1 grade, or better, shall be further labeled with the "Red Star Brand;" but in no case is the "Red Star Brand" to be used unless the grade is No. 1, or better. The grading, filling and condition of package shall be considered by the inspector in determining the proper grade, but in no event shall any package receive the "Red Star Brand" unless it be of standard size and well filled. After produce has been delivered to the exchange, inspected and branded, under no circumstances shall it be withdrawn from the control of the exchange. If any agent shall report to the general office for sale or consignment any produce without its having first been duly inspected and branded with the "Red Star Brand," if entitled thereto, then such act upon the part of said agent shall be deemed sufficient cause for suspension and removal of said agent. No produce shall be received, inspected, branded or reported to the general office of the exchange for sale or consignment except it be grown or owned by a stockholder, or tenant of a stockholder, of the exchange in good standing, and the violation of this provision shall be deemed a good and sufficient ground for the suspension and removal of said inspector or agent.

Article 9.

All stockholders in the exchange shall be compelled to ship through the exchange, but shall be allowed to sell outside at an advance of not less than five per cent. (5%) on the price they would receive from the exchange: Provided, however, that said goods have not been received, inspected or branded. Any violation of the foregoing prohibition by a shipper shall deprive him of the rights and privileges of the exchange.

Article 10.

All amendments or alterations to the constitution and by-laws shall be submitted in writing and lie over until the next meeting of the board of directors, and shall require two-thirds (2-3) of the members present to adopt same.

CONSTITUTION AND BY-LAWS OF THE HOOD RIVER APPLE GROWERS' UNION.

Article I.

The name, place of business, capital stock and purposes of this corporation are set forth in the articles of incorporation, which are referred to as part of these by-laws.

Article II.

The membership of this corporation shall be confined to actual growers of Hood River Valley and vicinity.

Article III.

The board of directors shall consist of nine members, four of whom shall hold office for more than one year. They shall be elected annually and shall serve until their successors are elected and qualified. They shall qualify as directors within ten days after their election, and within ten days thereafter they shall elect from their number a president, vice-president and secretary. They shall also choose a treasurer, who shall be required to give bonds, with surety in such sum as they may deem ample. They may choose a bank as treasurer without bonds. The annual meeting shall be held on the first Saturday in April in each year.

Article IV.

The directors shall have the power to levy and collect assessments on the capital stock not to exceed fifty per centum of the stock subscribed at any one time, and not oftener than every sixty days; the same to become delinquent in thirty days from date of notice of such assessment in the local newspaper. The directors shall sell shares of stock to actual fruit growers only.

Article V.

The directors shall employ such agents or other employes as are necessary to do the business of the corporation, and shall fix their remuneration: Provided, that the board of directors shall receive no salary for acting as directors. They shall have daily account sales rendered to the members of the union each day, as received by them or their agent, giving a statement by whom sold, gross sales, commission, freight or express, and amount due members of the union; also giving condition of fruit, if there be any complaint.

Article VI.

The directors may refuse to receive for shipment, under the brand of the union, any package of fruit not considered prime from any cause. They shall refuse to receive for shipment fruit from any person not holding stock.

Article VII.

This organization, through its board of directors, shall have the exclusive and unqualified power to market all apples grown by any of its members. A contract between each member and the board will be required.

Article VIII.

The duties of the secretary shall be to keep a record of the proceedings of the meetings of the stockholders and directors. He shall keep the corporate seal of the association and shall be the custodian of all deeds, articles of agreement and other valuable instruments of writing belonging to the association. He shall keep all books of the issuance and transfer of stock and shall countersign all certificates of stock and affix the seal of the board of directors and stockholders, and shall keep or cause to be kept all books of account necessary to the transaction of the general business of the association. The manager of the union shall be placed on a flat salary.

Article IX.

The board of directors shall provide the necessary means for carrying out the purposes for which the association is formed, by reasonable charges and commissions for the service rendered by the association to its members and customers.

Article X.

The duties of the treasurer shall be to receive all moneys due or paid to the association and deposit the same as the directors may instruct; to pay out said funds upon the written order or check of the president, first vice-president or general manager, when countersigned by the secretary.

Article XI.

All notes or other evidence of indebtedness of the association shall be signed by the president and countersigned by the secretary of the board of directors.

Article XII.

The president shall instruct the secretary to call a meeting of the stockholders whenever in his judgment the necessities of the union require it, by giving one week's notice through the local newspaper and send each a notice on a postal card.

Article XIII.

No union label shall be placed on a box of fruit except by the manager of the warehouse just before shipping.

Article XIV.

Each packer will be held responsible for his own work by a system of fines. No fruit will be received unless put up by a packer employed by the union.

Article XV.

The union will have no packing house foremen, except those employed by the union.

Article XVI.

A majority of the stock subscribed, upon which all legal calls or assessments have been paid in full, shall constitute a quorum at any stockholders' meeting, and no vote shall be counted which is not represented by one share of the stock upon which all calls or assessments have been paid.

Article XVII.

These by-laws may be amended by vote of the majority of the stock upon which all calls or assessments have been paid, at any regular or called meeting: Provided, that notice to amend the by-laws shall have been given in the call for a special meeting.

Article XVIII.

Any member desiring to dissolve his connection with the corporation may do so by surrendering his stock to the secretary thereof or by transferring it to any member in good standing on the secretary's books.

ADVICE TO GROWERS.

Members of the Hood River Apple Growers' Union.

1. The union will notify you by mail when a variety is to be picked. Upon receipt of such notice, pick, wipe and sort the apples, and get everything ready for packers, as follows: Packing house, boxes, paper, packing table, nailing machine, nails, etc. Notify the office or the field inspector when you are ready for packers. The field inspector will then call on you, and if in his judgment the job is ready for packers, he will arrange to put the packers at work; if not, he will advise you how to proceed.

2. Picking. If the weather is hot, pick during the cool part of the day. Do not allow pickers to pull off fruit spurs, not bruise apples by dropping them into buckets or boxes. Apples should be placed in the baskets or boxes, and not dropped in or poured in. The stems of the apples should not be broken off. Haul the apples from the orchard to the packing house daily; Do not allow them to stand in the orchard in the sun.

3. Wiping and sorting. Wipe the apples just enough to make them clean and get off the spray. Do not polish them. Sorting should be done when the apples are being wiped. In sorting, keep the fancy grades in boxes to themselves, the choice grades by themselves and the culls separate. Put 4-tier apples and larger together, and 4½-tier and smaller together. Fancy Spitzenburgs should always be graded for color, 70 per cent, or more good red color. Keep the light Spitzenburgs separate from the red ones. Special advice will be given on other red varieties for color as sold.

4. The grower will be held responsible for quality, and is required to do all the sorting. The packers will not be held responsible in any degree for the quality of the apples. It is the packer's business to pack apples and not to sort them. If the apples are not satisfactory for quality upon final inspection at our warehouse, they will be set aside, the grower notified, and a special arrangement effected between the grower and the manager as to the disposition of the fruit. If it is decided to repack, the repacking will be done at the grower's individual expense. If the apples are to be shipped without repacking, they will be shipped in the next lower grade, or if too poor for the second grade, they will be shipped in the grade to which they properly belong. For instance, if packed for fancy and rejected, they may be handled as choice if good enough; if not, they will be consigned to a local market for what they will bring. The grower will be held responsible for quality, the packer is responsible for the packing only.

5. The packing house should be arranged to let in plenty of light and keep out the wind. Provide sufficient lamp light for late in the afternoon, as it gets dark early.

6. Packing tables. Each grower should have one packing table and more if needed.

7. Paper. Get plenty of paper early in the season. Paper for sale at the union warehouse in town.

8. Boxes. Have a sufficient number of them on hand. Keep them clean. Do not pack fruit in dirty boxes. Buyers will not receive dirty boxes, and the union will not accept them.

9. Apples on packing table. Growers are expected to keep the packing tables properly filled for packers.

10. Piling loose boxes of apples. Do not fill the boxes too full of loose apples for piling in your warehouse, or the apples will be bruised by the next box placed on top. If boxes should be too full, either take some out or place cleats between the boxes. No box should be placed on top of a box of apples so full as to cause pressure upon the apples in the under box.

11. Piling packed boxes of apples without covers. Keep the packed boxes out of the way of the packers, and do not under any circumstances allow the packers to pile a box of packed apples on top of a box already packed and waiting for the cover. This will certainly bruise the apples, and may cause you loss when the pack is inspected at the union warehouse. The union cannot accept apples which show bruises, no matter how caused.

12. Piling and loading. After covers are nailed on, always pile boxes of apples on the side, and load into wagons on the sides. Do not pile boxes of apples into wagons by standing them on the ends. This doubles the risk of bruising when hauling by increasing the weight on the apples in the under end, and settles the apples in the box, making an empty space in the top end, and the pack may be rejected for loose pack. Packers will not be held responsible for loose pack when the apples come to the warehouse loaded in this way. Always pile boxes of packed apples on the sides and load them into your wagons the same way.

13. Grower's number and name. Each grower is required to put his number on each box with a rubber stamp in the upper right hand corner of the end. Numbers will be supplied free by the union. The State law requires the grower to put on his name and postoffice address with a rubber stamp. You can order these stamps of the union or at a stationery store.

14. Name of variety and number of apples. The grower will put on with a rubber stamp the name of the variety of apples in the center of the box near the top, and the packer will put on with a rubber stamp the number of apples contained in the box, just above the name of the variety. Be sure and do this right. All stamping must be done on one end of the box.

15. Hauling. Haul on springs, and use a wagon cover to keep off the dust and rain. Pile the boxes on the sides. Haul as soon as packed. Don't keep them unless so advised.

16. Nailing. Use four nails on sides, four on tops and four on bottoms. The best nail is a 5-penny barbed or cement coated nail. Please do not use any other.

Grading Rules.

Fancy grade. This grade consists of perfect apples only. The apples must be free from worm holes, stings, scale, fungus, scab, rust, or any other disease, and free from all insect pests, decay or injury. They must be free from bruises and limb rubs, and the skin around the stem must not be broken. All apples must be clean, fully matured, not deformed and must have a healthy color. Spitzenburgs must have 70 per cent. or more of good red color. All red apples must be of good color.

Choice grade. This grade consists of apples a little below fancy, and includes such apples as are not perfect. These must be good apples, not culls. No apples with worm holes or broken skin will be accepted. Limb rubs must not be larger than a 10-cent piece. Only two stings will be allowed, and no sting is permitted where the skin of the apple is broken. No apples will be accepted with San Jose scale, dry rot, or which show an open or black bruise. Apples showing fungus will not be permitted where the spot is larger than one-half inch in diameter.

Instructions to Packers.

1. Each packer, before beginning work, must have his name registered at the office of the union and receive a rubber stamp free. He shall be required to stamp each box of packed apples at the lower left hand corner with his official stamp.

2. Every packer must put up a first-class pack.

3. When a box is packed, the packer shall stamp with a rubber stamp upon the end of the box, in the center near the top, the exact number of apples the box contains.

4. Each box of apples must be packed with about a three-fourths inch to one inch swell in middle of top and bottom combined, but no box should be packed so high that it will be necessary to cleat the box before nailing on the lid. A swell on the box, however, does not necessarily mean a tight pack; the apples must be tight from side to side and from end to end. The union wants a tight pack.

5. The packer will receive pay from the grower in cash, or a written order on the apple growers' union, which will be cashed on presentation at the office.

6. Packers will be furnished meals by the grower without charge, but must make necessary arrangements for bedding. The grower will furnish bed and mattress.

7. Packers are required to pack only apples properly wiped and sorted. If in your opinion the fruit should seem to be running poor grade for the pack you are putting up, notify the field inspector or the office at once.

8. Each packer must set off his box when packed. Do not set a box of packed apples on top of another box of packed apples which has no cover. This will bruise those in the under box. Be very careful about this.

9. Packers are paid by the hour, or by the day, based on ten hours per day.

10. The packers are all under the supervision of the field inspector, who may dismiss any packer for cause.

11. All packers must refrain from smoking on the premises of any grower against his wishes. Failure to do so will result in dismissal.

Special. The union wants a tight pack of good apples. Don't jam the apples in and bruise them, but be sure to fill the boxes solid full in all directions, up and down, sideways and endways. Don't pack slack; pack full and tight.

Sizes. Four-tier apples include nothing smaller than 128 size.

One hundred and forty-four size is special.

Four and one-half tier includes 150 to 175 size.

Five-tier includes 185 to 200 size.

ARTICLES OF AGREEMENT OF THE OZARK FRUIT GROWERS' ASSOCIATION.

First—That the name of the corporation shall be "Ozark Fruit Growers' Association."

Second—That the corporation shall be located in the city of Springfield, in Greene county, Missouri.

Third—That the amount of capital stock shall be two thousand dollars, divided into two thousand shares of the par value of one dollar each; that the same has been bona fide subscribed and ——— actually paid up in lawful money of the United States, and is in the custody of the persons hereinafter named as the first board of directors.

Fourth—That the name, places of residence of the shareholders and the number of shares subscribed by each are ———.

Fifth—That the board of directors shall consist of nine (9) shareholders, and the names of these agreed on for the first year are P. A. Rodgers, G. A. Atwood, Louis Erb, M. F. H. Smeltzer, T. C. Love, G. T. Lincoln, E. L. Beal, J. A. Taylor, H. T. Hartzog.

Sixth—That the corporation shall continue for a term of twenty-five years.

Seventh—That the corporation is formed for the following purposes:

To provide ways and means for the growers of fruit and other farm products in the states of Missouri, Arkansas and other states and territories, to secure, by co-operation among themselves and with railroads and express companies, and by all other lawful means, the cheapest and best transportation services for their fruits and other farm products, and the proper distribution, marketing and sale of same.

By-laws of the Ozark Fruit Growers' Association.

1. Any person may become a member of the Ozark Fruit Growers' Association who will take stock in the association at the discretion of the directors.

2. The capital stock of this association shall be divided into shares of one dollar ($1.00) each, said stock to be issued upon written application of subscribers.

3. All corporate powers of the association shall be exercised by a board of directors to consist of nine (9) stockholders, five (5) of whom shall constitute a quorum for the transaction of business, who shall be commercial fruit growers.

4. The officers of the association shall be a president, a first and second vice-president, a secretary and treasurer.

5. The board of directors shall be elected by a vote of the stockholders at the regular annual meeting of the association, as follows:

Three directors, whose terms of office shall expire in one year or at the next annual meeting of the association; three directors, whose term of office shall expire in two years or at the following annual meeting of the association; and three directors, whose term of office shall expire in three years at the succeeding annual meeting of the association, and until their successors are elected and qualified.

6. The officers of the association shall be elected by the board of directors at a regular meeting to be held in Springfield, Missouri, immediately following

annual meeting of stockholders; said officers shall hold office for a term of one year or until their successors are elected and qualified.

7. There shall be an annual meeting of the stockholders of the association held in Springfield, Missouri, on the first Tuesday of January of each year, for the purpose of electing directors whose terms of office have expired, and to secure the reports of the officers of the association for the fiscal year preceding, and for the transaction of any other business that may be properly brought before them. A majority of the stockholders present shall constitute a quorum, and a meeting of stockholders may be called at any time by the board of directors.

8. Regular meetings shall also be held on the second Tuesday in March, second Tuesday in June and second Tuesday of September of each year, for the transaction of business other than the election of directors.

9. There shall be a meeting of the board of directors on the Monday preceding the annual stockholders' meeting, and at such other times as the president or any two (2) directors may deem best, for the purpose of examining the books and affairs of the association, and for any other business that may come before them.

10. In all stockholders' meetings of the association, each stockholder shall be entitled to one (1) vote for each share held or owned by him, either in person or by proxy, and all proxies shall be in writing.

11. In all elections or questions decided by the board of directors, each member present in person shall be entitled to one (1) vote, and a majority of the votes cast shall decide the question.

12. The board of directors shall employ such agents as may be necessary to carry out all the purposes for which the association was formed, and an employe may at any time be removed by said board for any cause deemed sufficient by the board. The salaries of all officers and employes of the association shall be fixed by the board of directors.

13. The duties of the president shall be to execute the policy indicated by the board of directors; to have a general supervision of the business of the association; to call a meeting of the directors whenever he thinks it necessary; to preside at all meetings of the stockholders and directors; to sign all contracts, deeds, certificates of stock and other important agreements in writing not here specified.

14. The duty of the first vice-president shall be in the absence of the president to perform all the duties devolving upon the president.

15. The duties of the secretary shall be to keep a record of the proceedings of the meetings of the stockholders and directors. He shall keep the corporate seal of the association and shall be custodian of all deeds, articles of agreements and other valuable instruments of writing belonging to the association. He shall keep all books of the issuance and transfer of stock and shall countersign all certificates of stock and affix the seal of the board of directors and stockholders, and shall keep or cause to be kept, all books of accounts necessary to the transaction of the general business of the association.

16. The board of directors shall provide the necessary means for carrying out the purposes for which the association is formed by reasonable charges and commissions for the services rendered by the association to its members and customers.

17. The duties of the treasurer shall be to receive all moneys due or paid to the association and deposit the same as the directors may instruct; to pay out said funds upon the written order or check of the president, first vice-president or general manager, when countersigned by the secretary.

18. All notes or other evidences of indebtedness of the association shall be signed by the president and countersigned by the secretary of the board of directors.

19. The board of directors shall require a good and sufficient bond from all officers, agents and employes receiving, disbursing or handling the funds of the association, from some reliable indemnity company, to be approved by the board of directors.

20. The fiscal year of the association shall close on the 31st of December each year, and all annual statements shall cover the operation of the association from the beginning to close of said fiscal year.

21. The articles of agreement or the by-laws of the association may be amended at any regular meeting of the stockholders, but each amendment must have been first proposed at a previous regular meeting.

Terms of the Contract With Sub-associations.

This contract, entered into this — day of ——, 1908, between the Ozark Fruit Growers' Association, a body incorporated under the laws of the State of Missouri, party of the first part, and ———, party of the second part; witnesseth that for the consideration hereinafter named, the party of the first part agrees to furnish party of the second part, daily during the marketing season, the condition of the markets, and so far as can be known, the daily movement of the strawberry crop; to prosecute all claims of the party of the second part that may arise against transportation companies, or refrigerator car companies, for failure to discharge their obligation in the transportation of icing of cars, and all other claims that may arise; to keep efficient men in the principal markets, for taking orders, for looking after cars when the same reach their destination; for adjusting difficulties that may arise between buyers and consignees and the said ———, and any other matters affecting the interest of party of the second part.

The Ozark Fruit Growers' Association further agrees to sell on track, so far as can be done, all car load shipments of strawberries for party of second part, but when not practical to sell, to consign the same to the most reliable commission firms known. For the above and all other services to be rendered by the Ozark Fruit Growers' Association for the party of the second part, the said ——— agrees to place the selling or consigning of its car lot shipments of strawberries under the direction of the Ozark Fruit Growers' Association, and to allow the said Ozark Fruit Growers' Association two per cent. of the gross proceeds of all cars sold, or two per cent. of the three per cent. rebate usually allowed on car lot shipments by commission houses on the gross sales of all cars consigned, the remainder, or one per cent., to be remitted to the party of second part. It is further agreed that the ——— association may sell its berries subject to the approval of the O. F. G. A. It is further agreed and understood that the party of the first part is the agent of the party of the second part.

(Signed): ————————, President Ozark Fruit Growers' Association.
————————, Secretary Ozark Fruit Growers' Association.
(Signed): ————————, President.
————————, Secretary.

CONSTITUTION AND BY-LAWS OF THE NEOSHO FRUIT GROWERS' AND SHIPPERS' ASSOCIATION.

Preamble.

For the purpose of co-operating in the marketing of fruits and vegetables, and in providing packages for same, we, whose names are hereto annexed, adopt the following constitution and by-laws:

CONSTITUTION.

Article I.

This organization shall be known as the Neosho Fruit Growers' and Shippers' Association.

Article II.

The officers of this association shall be president, vice-president, recording secretary, treasurer, business manager, and a business committee, consisting of five members, including the business manager, all of said officers to be elected by ballot in August of each year. The business committee to be elected first. A majority of all ballots cast shall be necessary to elect. The election of officers shall proceed in this way: In case of the business committee, an informal ballot shall first be taken, each member voting for the five of his choice on a single ballot. Of the names resulting, all shall be dropped except the ten receiving the highest number of votes. From these ten shall be elected five for the business committee. The second ballot shall be for the first member of the business committee, who also shall be the business manager. If on first ballot no one shall receive a majority of the votes cast, all names shall be dropped except the three receiving the highest number of votes. If on the second ballot no one receives a majority of the votes cast, the name receiving the lowest number of votes shall be dropped, and a new ballot taken upon the remaining two and until one is elected. Each member of the business committee shall be elected in the same way. For all other officers there shall first be taken an informal ballot. If on this ballot any one should receive a majority of the votes cast, he shall be declared elected without further voting. If on this ballot no one should receive a majority of the votes cast, a second ballot shall be taken upon the three names receiving the highest number of votes, a third, if necessary, upon the two highest, and the voting shall continue on these two until a choice is made. No member of this association shall hold more than one office in the association at one time, except the business manager, who is also required to be a member of the business committee. An habitual frequenter of a saloon or a gambler is not eligible as a member of the business committee.

Article III.

This association shall meet on the fourth Saturday of each month at the Woodman hall in Neosho, at 2 o'clock p. m., unless adjourned to meet elsewhere.

Article IV.

Any person who is a horticulturist or agriculturist may make application for membership (in writing), and must be recommended by two members of the association. The membership fee of one dollar, and the annual dues of one dollar must accompany the application and be offered at a regular meeting by some member of the Association. The application will then be referred to a committee of three members and laid over to next regular meeting, when, if report of committee is favorable, it shall be balloted upon. An applicant to be elected must receive a majority of all votes cast, seven negative votes being necessary to reject.

Article V.

When growers in this association ship berries as a firm or company, each individual member of the firm or company must become a member of the association. No firm or company will be allowed to vote by proxy on any proposition before the association.

Article VI.

The annual dues of this association shall be one dollar, payable August 1 each year.

Article VII.

A quorum shall consist of seven members to do business.

Article VIII.

In case of a vacancy in office, the vacancy shall be filled at the first regular meeting, or in case of emergency, at a called meeting.

Article IX.

This constitution may be amended at any regular meeting by a three-fourths vote of the members present: Provided, the proposed amendment shall have been written and in the hands of the secretary and read by him at two regular meetings previously.

BY-LAWS.

No. 1. All officers of this association shall assume the duties of their respective offices at the August meeting and perform the duties required of them by the rules of the association. The president shall call special meetings when requested to do so by the business committee or on petition of five members of the association. The deliberations of this association shall be governed by the rules of Cushing's Manual of Parliamentary Usages.

No. 2. The vice-president shall, in the absence of the president, perform the duties of the president. In the absence of both president and vice-president, a temporary chairman may be elected by the association. The chaplain shall conduct the devotional exercises of the association.

No. 3. The recording secretary shall keep an accurate minute or record of all the transactions of the association. He shall be the keeper of all the papers and records of the association except his own bond. He shall collect all moneys due the association for dues, fees, fines and forfeitures. He shall pay over all moneys coming into his hands to the treasurer every month, taking

the treasurer's receipt therefor, and file said receipt with the auditing committee as soon as they are appointed. He shall give a bond of four hundred dollars, signed by two good securities. Said bond shall be kept by the president. He shall receive twenty-five dollars per year for his services.

No. 4. The treasurer shall receive all moneys belonging to the association from the hands of the recording secretary, giving his receipt therefor; render a true account of all moneys received and paid out and to whom paid. He will pay out money on warrants ordered by the asociation and signed by the president and secretary. He shall give a bond of one thousand dollars, signed by two or more good securities, and he shall receive twenty-five dollars per year for his services.

No. 5. The business manager shall act as secretary and treasurer of the business committee. He shall keep a full and correct record of all transactions of the committee and attend to all the correspondence of the association. He shall receive all the returns from the commission merchants and other sources, and make disposition of same as quickly as possible, as directed by No. 14 of the by-laws. When elected, he shall execute a satisfactory bond in the sum of $25,000 to the association as individual members, for the faithful performance of the duties required of him as secretary and treasurer. He shall receive for his services one per cent. of the net sales of all berries shipped. he shall employ a bookkeeper and all other help needed at the shipping sheds at salaries which, in his judgment, are economical to the association, and, at the same time, just to the one employed. The salary of the manager and other help shall be paid out of a fund created for this purpose. He shall have full control of the shipping sheds. He shall make and present to the association, not later than the August meeting, a full and complete statement showing the receipts and expenditures in detail. He shall present his books and accounts to the auditing committee when said committee is appointed to examine the accounts of this association, as provided by No. 18 of the by-laws.

No. 5 (Section 1). The business committee, as soon as they shall have been elected, shall organize by electing one of their number chairman. They shall meet at the call of their chairman. They shall have power over the actions of the business manager as a whole, and in case of sickness, death or any other disability of the manager during the shipping season, shall select a temporary manager. The chairman and each member of the committee, excepting the business manager, shall receive two dollars each meeting of the committee for members in attendance. It shall be the policy of the association to sell on track all fruit possible for which a satisfactory price can be obtained. It shall be the duty of the business committee to select the commission houses who shall handle such berries as are shipped on consignment.

No. 5 (Sec. 2). For the purpose of paying the business manager, bookkeeper and all other help and expenses incurred in the shipment of berries, there shall be set aside two per cent. of the gross sales of all shipments. After all salaries and expenses have been paid, the remainder of this fund to be prorated to the growers as other receipts. All of the bonds given by members of this association shall be approved by the association.

No. 6. Each officer, committee, agent, or any other member, shall present to the association an itemized account of any expense to which he may have been, that a warrant may be issued in his favor on the treasurer.

No. 7. Nothing shall be so construed as to hold any member responsible for the provisions of the constitution or by-laws, who shall voluntarily withdraw from the association or quit the business of fruit growing.

No. 8. Any member withdrawing from the association shall be entitled to

receive his dividend of the unexpended rebate, but shall forfeit to the association all other money belonging thereto.

No. 9. A voter in this organization shall be a member who is a grower of berries. No member shall have more than one vote on any subject.

No. 10. All members of this association must buy all of their crate material through the association.

No. 11. All members obligate themselves to turn over all berries to the business committee, to be shipped by them, except those they may need to supply home demand, or for shipment to friends. In no case shall any member be allowed to sell berries for shipment, unless he obtains consent of the business committee to do so. Upon complaint of any one that a member violates the above obligation, the business committee shall make an investigation at once, and if found guilty, the secretary shall be notified to drop his name from the membership list. It is of great importance that the growers deliver all fruit to the management, that commission houses arranged with may not at any time be disappointed by not receiving expected shipments. Each grower must deliver or be in line ready to deliver at the shipping sheds all berries he has to ship each day not later than ten (10) o'clock p. m.

No. 12. The grades of strawberries will be two, designated as "A" and "B" (the "B" grades blank). The "A" grade must be strictly choice, firm, sound stock, of good size. The "B" grade must also be firm and sound, but may be somewhat smaller. Where the difference in selling price is not noted on account sales of receivers, the secretary shall make division on a basis of a difference of 25 cents per crate between the two grades. Fruit that is too soft or otherwise unfit to grade "B" will be rejected.

No. 13. It shall be the duty of the business committee to employ a man of good judgment and ability to inspect all fruit delivered by growers for shipment, and he shall be given as many assistants as are necessary, and he shall have power to change grades and reject any and all fruit which, in his judgment and the judgment of the business committee, is unfit for shipment.

No. 14. Each grower shall receive the average price per crate of each grade each day. Should it be necessary to hold over berries from one day to the following day for shipment, then the number carried over shall be disbursed with that day's shipment. A clean-up shall appear as having been made each day.

No. 15. The secretary receiving berries must give each grower a receipt for the number of crates of berries delivered, designating the number of crates of each grade.

No. 16. All members obligate themselves to be governed by the decision of the association in regard to the prices to be paid for picking berries, and they agree that they will not in any manner, directly or indirectly, such as by gift, premium, or by counting more trays or quarts than has actually been received at the packing sheds, or through any member of the family, or any other individual, pay more than the price agreed upon by the association. The penalty for violation of this obligation shall be the withholding of thirty-five cents a crate for all berries received in violation of the above named by-law. All complaints shall be filed with the field inspectors, who shall investigate the matter and immediately report to the business committee, who shall act upon the matter promptly, and the funds accruing from the fines shall be turned into the general treasury. A copy of this penalty clause shall be incorporated into the rules for the packing sheds.

No. 17. The business committee shall have power to appoint a man as marshal if necessary, whose duty it shall be to see that each member shall be

allowed to unload his berries in the order in which he may come to the unloading place. He shall see that no one drives out of his regular turn. Any dispute between growers shall be settled by the marshal. Any grower who shall refuse to abide by the decision of the marshal shall forfeit his place and go back behind every wagon present.

No. 18. The president shall, at the regular meeting in June of each year, appoint the auditing committee, consisting of two members, whose duty it shall be to examine the books and accounts of the officers of the association and business committee and report in writing at the regular meeting held in August following. The auditing committee shall each receive two dollars per day as compensation for the time required to examine the books and accounts submitted to them.

No. 19. On any motion the vote shall be yea or nay, unless some member shall request the vote being taken by ballot, and upon such request being made, the president shall appoint two tellers to take the ballots; and when the voting is by ballot every member present shall vote, unless he is excused by the president, provided he is entitled to vote. Any voter refusing to vote, who has not been excused by the president, shall forfeit to the association fifty cents. A voter shall be a grower of berries.

No. 20. Any member who shall be in arrears for dues three months shall forfeit his or her vote and all benefits of the association, and when six months in arrears shall stand suspended from the association.

No. 21. Any member who shall have been proved guilty of fraud or immoral conduct, or failed to meet his just obligations, or of any other act so as to affect the credit and good standing of the association, shall be barred from membership.

No. 22. All members must acquaint themselves with the constitution and by-laws and annex their names thereto.

No. 23. Any member who is contentious, or who uses loud or abusive language, shall be dropped from the roll of membership.

No. 24. These by-laws may be amended in accordance with article 9 of the constitution.

STRAWBERRIES.

(By J. F. McNallie, Sarcoxie, Mo.)

Within the last few years the strawberry has become one of the most important fruits. Being the first to ripen in the spring, its tempting appearance, its delicious taste, and its wholesomeness as a diet, has made it universally popular. It has been aptly named the "Queen of Small Fruits."

And it was not so many years ago that strawberries were considered a luxury, while today in every home where they can be secured they are deemed almost a necessity in their season. On account of the ready sale and increasing demand for this fruit in the larger city markets, some sections are engaging extensively in the commercial growing of strawberries.

Southwestern Missouri soil is found especially adapted to the com-

mercial growing of this fruit, and from several towns in that district, train loads of strawberries are shipped each season to many cities of the United States.

Twelve years ago, Sarcoxie, Missouri, was shipping most of the strawberries of Southwestern Missouri, and because a number of surrounding towns embarked in the business, there was a cry of over-production. But this prediction was not justified.

Southwestern Missouri, in four weeks last season (1909), produced over five hundred cars, and they were readily disposed of, the most of them at a cash price on track. More markets each year are requiring strawberries in car lots to supply their demands. For instance, a certain city in North Dakota, which five or six years ago, could not use a car of berries at one time, this past season purchased on track, not consignment, ten cars in one day, and wanted five cars for the following day. A growing town in Oklahoma, five years ago, was oversupplied with twenty-five crates, while this season they required one to two cars daily. Undoubtedly, the markets of all cities and towns over all the country, are requiring strawberries in proportion.

According to the 1900 census, the total acreage reported of all small fruits was 304,029, and the total value $25,030,877, or an average of $82.33 per acre. Of these small fruits, strawberries led in both acreage and production. There were 151,373 acres reported, which produced 257,437,523 quarts, or 1,701 quarts per acre. The three adjoining states, Illinois, Arkansas and Missouri, produced 15.2 per cent of the total crop of 1899.

Selection of Ground.—Where conditions are such that one has a choice in selecting the kind of land to suit best for a strawberry patch, select it nearly level, just so it has a very gradual slope, sufficient to properly drain the water from it; if too sloping, hard rains will wash ditches between or across the rows. If steep hillsides have to be used, don't run rows up and down the hill lengthwise, but sidewise with the hill; it is better for the water to cut ditches across the rows than between them, as it is impossible to cultivate satisfactory with rows standing on ridges.

Kind of Soil.—While any kind of soil that will produce any kind of a crop will produce strawberries, don't expect to get a very large crop of berries from very poor soil, as it won't make it. The yield will be in proportion to the fertility of the soil, other conditions being equal. Ground that will produce an average crop of thirty to forty bushels of corn to the acre in this section, is considered good berry land, and will produce, on an average, 200 crates per acre without any fertilizing. Use the richest ground that you have, and your crop will be in pro-

portion, both in quantity and quality, like other crops. But if your neighbor has poorer land than you and cultivates and tends his berries better and raises larger berries and more of them, don't say that poor land is the best, but that labor is justly rewarded. If soil is poor, manure and work it in well before setting out plants. Should you desire to grow early berries, select dry warm ground, and for late berries use a colder and more protected location.

Preparing the Ground.—Ground should be broken as soon as the crop that is to be followed by the berries is harvested, and, if stubble, either sown in peas to be turned under to enrich the ground, or cultivated sufficiently to keep any weeds from going to seed during the summer or fall. During the winter, or at least, two or three weeks before time to set plants, as the ground is caught in right condition, rebreak very deeply, but don't harrow until time to set plants. If a rain comes before time to prepare the ground for receiving the plants, it will be a great help, as it is very hard to get dry, loose-broken ground in right condition otherwise. When ready to set out the plants, thoroughly pulverize the soil as deeply as possible. The deeper and finer the soil is worked, the better it will retain moisture, and the soil food will be rendered more available for feeding the plants. Use a roller or drag for packing the ground and making it smooth and level. A plank drag for the last working is preferable, as it fills up the horse tracks much better than a roller, and leaves the ground far smoother and more level. Never work the ground at any time while wet. Take great pains in preparing the soil for, like all other work in a strawberry field, it cannot be done too well for best results.

Selecting Plants.—If one has grown his own plants, don't use anything but the very best, and only from new beds, the one year rooted plants. If plants are bought, be careful in placing the order. Don't make the price the first consideration, but "am I getting what I ordered," is the most important. Be very careful in handling the plants not to get them mixed, so they can be properly harvested.

Selecting Varieties.—This is a very important matter and should have serious consideration. It is possible that on this one question alone depends your success or failure in the strawberry business. If plants were being put out only for one year, it would be different, but generally a field can be fruited from three to five years, and that makes it more important. Productiveness and firmness are the essentials, but the most important essential is size. All fruit propagators have this idea now in view, and try to produce new varieties that have the size. You never hear of a grower sending berries to the market and receiving a poor price because his fruit is large.

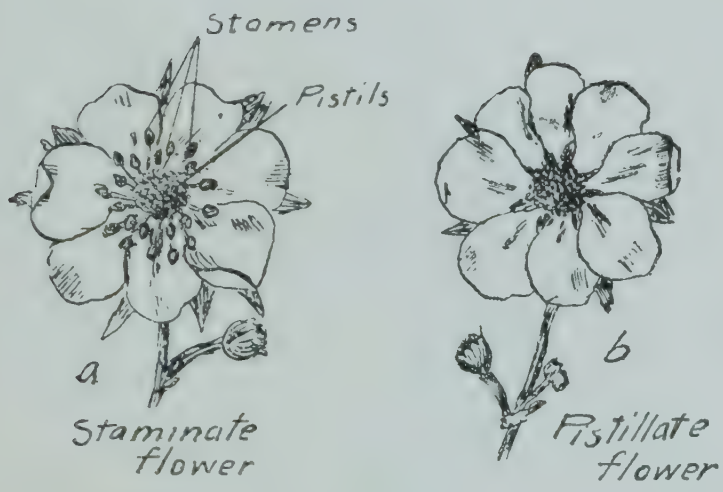


Figure 59. a, Staminate or perfect flower; b, pistillate or imperfect flower.

Figure 60. a, Plant set at the proper depth; b, plant set with crown too much above the surface; c. plant set too deeply.

Figure 61. A one-year-old strawberry plant. The line A-B shows how to prune th
roots for planting.

There are locations where the earliest, others where the medium, and others where the late berries pay the best, owing to competition. If growing for the home, or a nearby market, select some of the standard varieties, consisting of early, medium and late in ripening season. Some seasons the earlier and others the late berries bring the best prices, owing to the weather conditions and the demand. In this way one can extend the season and have three chances if there should happen to be unseasonable frosts or unfavorable weather conditions. Where berries are grown for the large commercial markets, one will have to be governed by what others grow, and what the markets demand. When Missouri strawberries are ripening, St. Louis demands the Bubach principally, and that variety is planted largely in that district. Kansas City and the northern markets require the Aroma, with Gandy, Dunlap, Warfield and Haverland following in the order named, while in Northern Missouri Warfield and Dunlap are the most largely planted. The variety Aroma, is planted more extensively in Southwest Missouri than any other. It has the size and is the most productive of any large sized variety.

When to Plant.—Plant as early in the spring as the ground will do to put in condition, and danger of freezing is over. Freezing does not hurt the plants if it is not hard enough to heave them out of the ground and expose the roots to the air. If a strawberry is rightly set and has started to grow, it can hardly be killed unless some insect destroys it. From the middle to the last of March is the best time in Southern Missouri, and from one to two weeks later in Northern Missouri. After May 1, strawberry plants are not in proper condition to be transplanted, until they become dormant again in the fall.

How to Pollenize.—Where varieties are prolific plant-makers, and are allowed to set thickly in the row, use staminates with the same tendency as much as possible. The principal cause of so many "buttons" and poorly developed berries is on account of insufficient pollenization; and this is the effect of pistillates being allowed to make plants out of proportion to the power of the staminates that are used, to produce plants and blooms. While it is safe to use a perfect flowering sort every fourth row with an imperfect bloomer, that is a poor plant-maker like the Bubach—such plant-makers as Warfield, Barton's, etc., should be fertilized every third row for best results. Therefore, two pollenizers of different seasons are recommended for all pistillates. For instance, for a pistillate classed as medium, use a staminate classed as early, and another as medium to late. By doing this, if from any cause the bloom of one is damaged, you have another chance for fertilizing. It is not always the early bloom that is damaged the most by frosts or

cold rains; it is the condition the bloom is in at time of danger. When a bloom first opens out it points directly upward, ready to be damaged in the most vital parts; later, it commences to turn down out of danger. As far as possible, select staminates that will correspond with the pistillate in size, shape, color, etc. If there is a close resemblance in these particulars it will be much more convenient in picking, as they will not have to be kept separate. But if there is not a close resemblance, each variety should be picked and packed separately. Very likely in the next few years there will be staminates propagated and introduced that will equal or be superior to the pistillates in quantity of bloom, and also as plant-makers, which will be a decided advance in strawberry culture.

Setting Plants.—There is no ironclad rule to be laid down for setting plants, as there are a dozen different modes practiced and each one believes his way the best. On beds of one or two acres or less, a line marked in some manner at the distance apart plants are desired to be set, is probably the best and most used method. On beds larger in size, some of the growers check off their ground both ways, making the rows three and one-half to four feet wide, and cross-marking from thirty to thirty-six inches, or whatever distance they desire plants set.

The distance apart to set plants in a row depends on the varieties planted. If plants are set early in the spring, from 20 to 30 inches apart during average seasons, will secure a good fruiting row of varieties that are good plant-makers; while extra prolific plant-makers can be set 30 to 36 inches and produce a good row. Some varieties that are rather poor plant-makers should be set 18 to 20 inches apart. In beds of three or four acres and up, we advise checking the rows both ways, and if this is carefully done, it will enable one to cultivate crossways two or three times before runners start to set, thereby saving much of the first hoeings.

The tools most used in setting plants are the common garden spade and the dibble; the latter is an instrument shaped something like a trowel, but has a straight shank to which the handle is fastened horizontally, and made of somewhat heavier material. Either tool will answer the purpose, but the main object is to get the dirt firmly pressed around the plant, not only at the top but down to the bottom of the root, so there will be no air space left to cause the plants to dry out.

Trim the roots to four and five inches in length, and be careful about the depth plants are set in the ground. They must be set deep enough so that no part of the root is exposed to air or sun, but not so deep that the crown is covered with dirt. Do not allow plants dropped faster than dibbler can use them, and keep them protected by a wet

cloth in a basket. Never expose plants to sun or air an instant longer than necessary.

Cultivation.—Cultivate as soon as possible after setting, the same day, if convenient. Cultivate often. If you have ground that packs and runs together badly it may be necessary to cultivate two or three times a week after a hard beating rain, to get the ground in proper condition. Where ground is packed hard, as soon as dry enough, plow shallow the first time, so as not to break up cloddy, follow immediately before it gets too dry, and cultivate as deeply as possible, then shallow again to level down. You will need to cultivate 20 or 30 times, owing to the kind of season, for best results. Cultivate from time plants are set out until killing frost. Don't ridge your plants, they will naturally do that, but work the dirt away from row, and keep as level as possible. By doing this it will be much better for the first crop and leave rows in better condition for renewing for second crop. After setting out plants, cultivate as close to them as you can without disturbing the roots. Allow the first runners to set until you have a row formed not to exceed 20 to 24 inchs in width, as that is as wide as you can permit and have plenty of room between for picking. Let the first runners set, which gives the plants a chance to make a good growth early so as to have sufficient time in fall to form fruit buds. When runners first form, pull them around with the cultivator until the row is filled between the hills. Always plow the rows the same way each time. After filling in between the hills, run the cultivator a little farther from the plants each plowing until the matted row is of the proper width, then attach rolling cutter to the cultivator and keep the runners cut off the balance of the season. Don't wait too long between plowing while the runners are forming fast, or you will get your rows too thick. Try to get plants set in the rows from four to six inches apart, which is as close as they should ever be to produce fine berries.

Keep the blooms cut off the first year. If the plants are allowed to fruit it stops the growth and consumes much of the vitality. Everything possible is to be done with the cultivator, but a great deal of hoeing will have to be done also. The first hoeing between the hills wants to be good and deep to get the ground that has been packed well loosened up but be careful not to disturb the plants. Keep the field properly clean of weeds the whole season, early as well as late. If you allow the weeds and grass to get the start of you at any time you may become discouraged. Never stop hoeing and cultivating because there are no weeds. If the ground is so poor that weeds will not grow there is the more need of work to change the particles of earth and get some fresh food where the plants can reach it, or they will starve. We be-

lieve that intense cultivation without fertilizing is better than poor cultivation and plenty of fertilizing; both are much better than either alone.

Mulching.—If you have only an acre or two of berries you can wait until the ground freezes hard to mulch, but if you have several acres would advise you to commence mulching as soon as frosts are hard enough to check the growth of the plants and turn the foliage brown. Mulching is slow work if you have to haul the material quite a distance; it is better to commence early in winter. During cold, wet weather it is disagreeable work, and you cannot make much progress. Every berry grower ought to mulch sufficiently to keep the berries clean. We commence in Southwestern Missouri the middle of November.

Wheat straw is used principally—the objection to it being that the wheat and cheat left in the straw grow during the winter and sometimes cause considerable damage to berries during the fruiting time. Prairie hay may be used if one is situated so he can afford to use it. In Southwestern Missouri we don't think it necessary to mulch for winter protection. The rank foliage of our matted rows seems to be sufficient to protect the plants from heaving. One ton of straw or prairie hay per acre, carefully spread over the rows is sufficient to keep berries clean, but two or even three tons won't hurt, if raked off between the rows as soon as the plants start to grow in the spring. It it should be dry during picking time, heavy mulching will be better as it will keep the ground moist much longer.

This past season we used a manure spreader in applying the mulch, and found it to give very satisfactory results. By adjusting the hood attached at the back of the machine, two rows, four feet apart, were covered at one time, and more evenly and with less material than if done by hand. For our fruiting beds with their wider matted rows, we previously had wheat straw hauled and unloaded at the ends of the field. To get on a sufficient load of this material, a frame was attached to the box of the spreader, and a hand kept on top of the load to pack the straw down, so that it would readily feed through the machine. By adjusting the openings in the hood to the width of the rows the mulch was evenly distributed, and two rows covered at once. To those who have or can secure a spreader, we advise a trial of this method of mulching. From our experience, we found it quicker, cheaper and the results satisfactory as the spreader will evenly distribute most any kind of litter or waste matter.

Picking and Packing.—This is one of the most important phases of the strawberry industry. One may have given the bed good cultivation, and have a fine prospect but if the fruit is not properly picked and

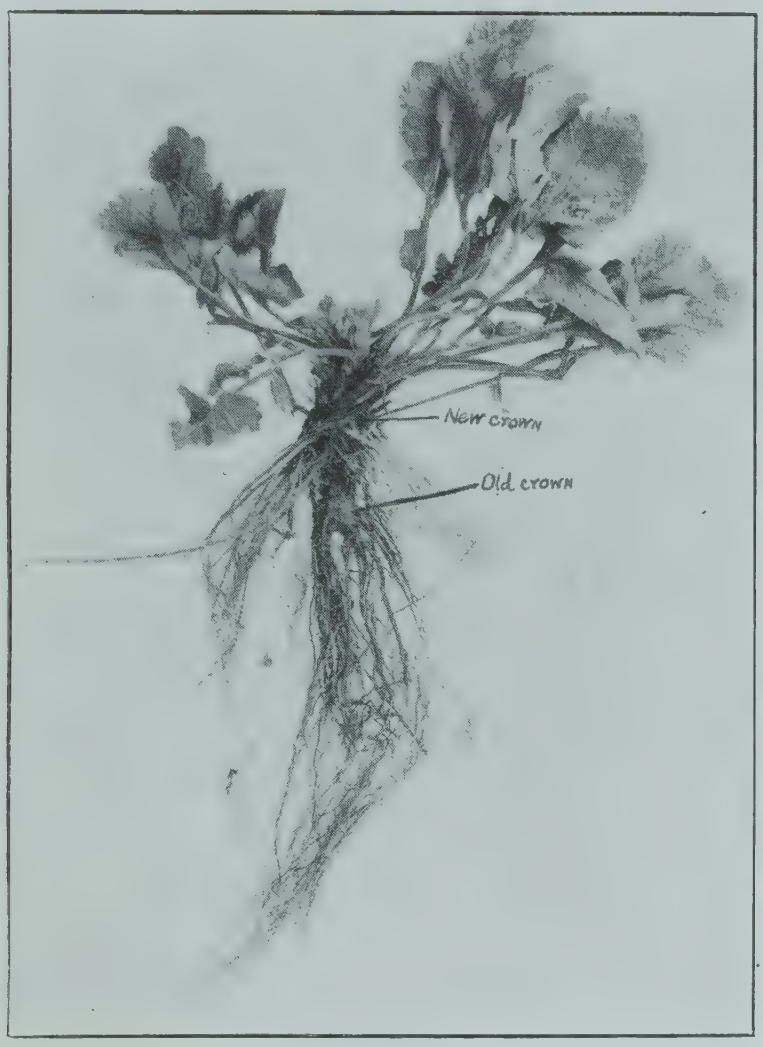


Figure 62. A two or three-year-old plant, showing both the old and new crowns.

Figure 63. A well-kept strawberry field, showing the mulching between the rows after the plants have started in the spring.

Figure 64. Strawberries as a catch crop in a young peach orchard at Pierce City, Mo.

packed, he will not get correspondingly financial results. Have everything ready before time to commence picking. Make crates and carriers during the winter. Use clean packages only, and have springs on the wagons in which the berries are hauled. Pick every day after the season is fairly started, and if the weather is rainy or there is much dew, wait until the fruit dries off somewhat before picking. Put a picker on each side of the row and do not allow them to snap berries from the vines, but pick with a stem one-half to three-fourths inch in length. Watch carefully to see that all ripe fruit is picked each time. Do not permit over six quart boxes to be taken to the field at a time as it keeps the berries exposed too long to the hot sun. Pack the fruit immediately in crates and store in a shady place protected from air, so it will keep its fresh appearance until ready for market.

If picking for a local market, or a market that will be reached over night, pick the fruit fully ripe, but not over-ripe or soft. If it is to be sent to a farther market, it should not be picked fully ripe, about three-fourths ripe will carry better, and it will ripen in transit. Try to grade the berries in the field if they need grading for every time a berry is handled it is damaged to a certain extent. Have each variety picked and crated separately, where possible, as uniformity in size and color has much to do with the appearance of the fruit. This part of the work should be under the supervision of one interested and any extra pains or labor taken will be rewarded.

Renewing.—A strawberry bed can generally be retained from three to five years if properly renewed and cultivated. To get the best results the work should be begun immediately after the last picking.

Mow the vines off close, and if the bed is covered with a moderate mulch, evenly distributed, it may be burned over as soon as dry enough. This method is the best for getting rid of any fungous diseases or insect pests, and leaves the ground in fine condition for clean cultivation. If the burning is done when there is a brisk breeze to carry a quick fire, there will be no harmful results. For a few days it may appear that there is nothing left, but in a short time the plants will put forth thriftier than ever.

If the mulch is not burned off it may be plowed under between the rows, or if too thick, raked up and removed from the field before cultivation begins. As soon as the vines have been mowed and burned off, the roots of the old plants are gotten rid of and the new ones favored by a method of plowing out the main part of the old row and leaving the new growth that has recently formed along its border. This method is as follows: Plow down the side of each matted row with a common turning plow, throwing the dirt from the row, and then

plow out the central part consisting of the old plants, thereby leaving a strip six to ten inches wide on the side of each old row. The side of the row is left because the plants there are younger, and will start to make runners more freely than the older plants, in the center.

To further reduce the plants and to put the ground in condition for cultivation, harrow the rows lengthways and then two or more times crossways. The older a bed becomes the fewer runners will be made from the plants left. So the width of the row and the number of times harrowed, will depend to a great extent on the age of the bed. After harrowing the same, cultivation is given as for a new bed.

Some growers successfully renew their fields with a disc harrow. They do this by removing three of the discs from the center and then the outside discs, until only three are left on each side. By placing heavy weights on the remaining discs and driving lengthway of the row each side is cut off at the same time. Harrowing is then practiced the same as when the turning plow was used. The disc harrow is especially recommended where the mulch is not burned or removed as it cuts up the mulch and works it into the ground leaving the field in good shape for cultivation.

Cost per Acre.—This is a very difficult question to answer, for so much depends upon the location, kind of soil, and weather conditions during the growing season. But from several years' experience and observation we would say that the average cost of growing an acre of strawberries during a normal season is fifty dollars. In a very favorable season this cost might be lessened as much as ten dollars while during an extremely wet season, or on very foul ground, it might be increased the same amount. In this estimate we do not take into consideration the use of commercial fertilizers or any expense of enriching the ground.

For illustration we give the following approximate figures as to the cost per acre up to harvesting time:

Rent for one acre	$5.00
Plowing and preparing ground	2.50
Five thousand plants (standard varieties)	15.00
Expense setting plants	5.00
Cultivating—fifteen times	7.50
Hoeing—three to four times	10.00
Mulch and spreading same	5.00
Total	$50.00

Profits per Acre.—This is a question that is difficult to answer, as the amount received for the crop will be governed by the varieties grown, the yield, closeness to market, and the manner of grading and packing. On soil that will produce thirty to forty bushels of corn

per acre, without the use of any fertilizers, the average minimum yield of strawberries will be one hundred, twenty-four quart crates; and the average maximum yield two hundred, twenty-four quart crates. In a favorable season, and where the bed has been given proper culture the maximum yield is often exceeded.

The price received depends mostly on the supply and the quality of the fruit, generally varying from 6¼ cents to 12½ cents per quart. Taking 8 1-3 cents as a comparative average price per quart throughout the season, the gross returns per acre of a one hundred crate yield will be $200.00; of a two hundred crate yield $400.00. Deducting the expense of picking, 1½ cents per quart, and the cost of crate, 14 cents, or a total of 50 cents per crate, the net returns will be from $150.00 on the minimum yield to $300.00 on the maximum yield. From these net returns charging the average expense of $50 for growing one acre, the profit will be from $100.00 to $250 per acre.

There are numerous places throughout the United States of from one to ten thousand population, where the people do not receive a sufficient supply of strawberries, principally because they are not large enough to dispose of car lots before perishing. To many around such places there is an excellent opportunity to commence the growing of this fruit and supply the steadily increasing demand.

There are no secrets to the growing of strawberries. Procuring good plants, true to name, thoroughly cultivating and careful and honest packing are the essentials. It is the surest fruit crop that grows in frigid, temperate or tropic climes. We have never known of a complete failure. In Southwestern Missouri in 1907, all other cultivated fruits were entirely killed by the severe freezes. With the exception of a few of the earlier varieties, from one-third to one-half of a crop of strawberries was harvested, while some of the later kinds produced a full yield.

DESCRIPTION OF VARIETIES.

S=Staminate or perfect flowered.

P=Pistillate or imperfect flowered.

Note.—For the convenience and information of inexperienced growers, the following varieties are recommended: For market, in the order of their importance, Aroma, Gandy, Warfield. For home use, in the order of their ripening, Excelsior, Michel, Warfield, Jessie, Senator Dunlap and Gandy. Promising, for market, Son's Prolific and Evening Star.

Abington (S)—A rather new variety originating in Massachusetts. Claimed to be superior to Bubach. Ripening the same time as that variety, as large, and holds up as well in size, and more firm. A better plant-maker than Bubach and more productive.

Almo (P)—Originated in Arkansas, and recommended by the introducer to be the most productive early berry grown, and a free market variety. It ripens about a week after the Excelsior and the fruit is about the size of the Lady Thompson, with a very dark color. We like the clean, healthy plant growth of this variety, being a good plant maker of medium sized, light-colored foliage. It makes a very large, stocky, well-rooted plant, and being a pistillate we believe it is worthy of trial as an early market sort.

Armstrong (S)—Introduced from Germany twelve years ago, and until lately controlled by a few German fruit growers in New York State. Claimed to be the one of the largest and most productive berries grown. "Whole crates often being filled with berries that run twelve to fifteen to the quart, and have sold on the northern markets for ten to fifteen cents per quart when other berries were bringing six cents." With us it is a good plant maker of large stocky plants, extra well rooted, with thrifty, heavy, dark colored foliage.

Arnouts (S)—Originated in Pennsylvania. Large, heavy, thick foliage, and free to make large healthy plants. "Productive, firm, large bright red fruit, and ripens evenly all over. Does not send fruit stems above foliage while in blossom, and therefore is never injured by late frosts. Season early and lasts a long time."

Aroma (S)—The king of strawberries in Southwest Missouri. For several years this berry has been growing rapidly in favor, and for the last three or four years has been the leading late variety in this section of the country. It has largely supplanted the well-known Gandy as it seems to be suited to a greater variety of soils, and probably three-fourths of the acreage planted in Southwest Missouri this season will be of the Aroma. While it commences ripening a little earlier than Gandy, it generally lasts as long, is much more productive, and there is no berry that outsells it on the market. A good plant maker and free from rust. Fruit very large, roundish in shape, rarely misshapen and deep, glossy red in color.

Auto (S)—Introduced in 1905 as the largest, handsomest, and most profitable mid-season market berry.

Barton's Eclipse (P)—This is a variety that probably would be more of a favorite among growers, if its foliage were not subject to rust some years. Medium to late.

Beaver (S)—A good plant maker of healthy, medium sized plants and foliage. It yields a good crop of large roundish, conical berries bright red, shining and beautiful. Excellent in quality, medium in season.

Bederwood (S)—An old early variety, noted for its productive-

ness and drouth-resisting qualities on account of its long roots that extend deep into the soil. In some sections the fruit runs down to small size and has a light color.

Ben Davis (S)—Originated in Missouri. It is a good plant maker of healthy, stocky foliage. Quite productive. Berries large, round, regular in shape, firm and dark red. Mid-season.

Bismarck (S)—When this berry was introduced it was expected that it would supersede the Bubach. It is as productive as that variety, a better plant maker, and its fruit is firmer, but it will not produce as many extremely large berries as Bubach, and some object to their lighter color. It is medium in season and a good pollenizer.

Brandywine (S)—A berry that differs from most varieties, in having broad, heart-shaped, bright yellow seeds, and a very large calyx. A good plant maker, productive, firm and from medium to late in season. With us some seasons, the calyx turns brown and injures the appearance of the fruit. This variety does well in some sections, and we note that in some parts of California, it is their most profitable berry.

Bubach (P)—A well-known variety, noted for its large size and productiveness. Mid-season in ripening, but a poor plant maker, which is probably the main reason of its success in maturing large fruit. It is a variety that generally exceeds its promises at blooming time, for all of its fruits are of a marketable quality. Especially recommended for home use or near market.

Cardinal (P)—Introduced four years ago, and backed with as many strong claims and more flattering recommendations than any new variety ever introduced. This seedling was discovered in 1896 by Mr. Geo. Streator, a horticulturist of national renown. It has been tried in different sections of the country, and flattering reports were received from every place. It has been grown among forty varieties for comparison, and in luxuriant growth and productiveness it far excelled them all. "Fruit roundish or roundish conical, medium to large, bright crimson, not fading; quite firm and solid, medium to late in season, closely following Bubach." We fruited this variety last year in a small way, and were very much pleased with it. We believe it has great merit as a commercial variety. It is a remarkable plant maker, of strong, healthy plants, and some growers assert that it can be planted four by four feet and extra good fruiting row secured.

Challenge (S)—Originated in Missouri. Medium plant maker of medium sized, healthy foliage. "It is a great favorite in some sections, notably along the Pacific Coast, and in such places it is preferred to all others. One of the best for dry weather, medium early in season."

Chesapeake (S)—New. Originated near Chesapeake Bay, from

which it received its name. Introduced in 1906 and claimed to be as late as the Gandy, more productive on lighter soils, and equal to it in size. "Its shipping qualities far excel that popular standard variety and in eating quality ranks among the best."

Climax (S)—An early variety, ripening three or four days after Excelsior and supposed to be a cross between Hoffman and Bubach. The plants are strong and vigorous and have a very prominent light green color. It is productive and lasts a long season. In the east it is quite prominent as an early market berry and seems to do well in all sections where tried.

Clyde (S)—If the season and soil are just right it is fine. The roots and crowns of the plant are above the average in size, and is a fair plant maker, but most years it does not produce foliage sufficient to protect and properly nourish its fruit at ripening time. Too many of its berries will rot on the under side before they ripen enough for picking. It is medium early, very productive, fruit large to very large. It is strong in pollen and makes a good early pollenizer for mid-season pistillates.

Cobden Queen (P)—A very vigorous and healthy plant maker. Very productive; fruit firm, medium in size, deep crimson in color and a good shape.

Columbia (P)—A good plant maker, and a thriftier, ranker and darker colored foliage growth than any variety we grow. The variety originated here at Sarcoxie, by the well-known nurserymen, Wild Bros. It has good parentage, being a product of systematic crossing of Warfield with Gandy, two of the best shippers. The introducers have fruited the variety for years, and offer it with confidence. They describe it as possessing about all that is desired in a commercial variety, being very large and of a bright attractive color that appeals. As to size, it is uniformly large and in season it ripens between Aroma and Gandy.

Crescent (P)—One of the very oldest varieties grown at the present time. While it is discarded in most sections it is largely grown in other places yet, on account of its season and productiveness. It is about the earliest pistillate variety, but after the first picking, the fruit runs down in size quickly, and becomes soft. Not profitable as a commercial berry.

Dayton (S)—This variety resembles the Haverland in size and shape of fruit, but is darker colored. It is a very early medium variety, productive but not firm enough for long shipment. Recommended as a garden berry or for home market.

Dornan (S)—This is rather a new variety, and was introduced as the Uncle Jim. We have ben impressed with the plant growth of this variety; they make thrifty, large crowns and large roots; the

foliage is large and taller than any variety we grow. It is medium to late in ripening and productive of very large berries that hold up in size as well as the Bubach. While we can not class it as extra firm, we believe it is a variety that is worthy of trial.

Downing's Bride (P)—We have fruited this variety several years and consider it was appropriately named. The appearance of its fruit is as handsome as any bride could wish to be. It is very large, firm and productive; and holds up well in size to the very last picking. In color it is of a deeper glossier red than the almost ideal Ridgeway. Mid-season; a fair plant maker, which sends out very long runners before another plant is formed and therefore does not set its plants too close together. It has thrifty, upright foliage, though the plant does not make many or very long roots, and this feature might make against its productiveness in a very dry season.

Enhance (S)—Medium to late, a long season, a good pollenizer; first berries irregular in shape, but become regular after a few pickings; from medium to large in size, a good shipper, and a good plant maker.

Evening Star (S)—A new variety that is claimed by some to be likely to take the place of the Aroma. We have not fruited the variety, but the introducer says: "Large, perfect bloom, with plenty of pollen. A seedling of the Gandy, and larger in fruit and plant than that variety, yielding double on the same soil. Berries of a bright red color, and good shipper." Late in season.

Excelsior (S)—An early berry planted extensively, especially in some of the southern sections. It commences to ripen about the same time as the Michel, but after two or three days will ripen much faster than that variety; on that account it produces more extremely early berries than Michel's Early. Foliage tall and dark green, some rust; fruit almost round and very dark red; firm and a much better shipper than the Michel. It is a good plant maker but if rows are allowed to become too thick, the last pickings will be small. A few object to it on account of its tart flavor, but we believe no one will mage a mistake in planting it for an early berry. It is productive, a nice looking berry, a good shipper and sure plant maker.

Gandy (S)—Before the Aroma became so well known, the Gandy was the favorite late berry among most strawberry growers. It is a good plant maker, very large, firm, and a good shipper, either in refrigerator cars or by express. It is not adapted to as many kinds of soil as the Aroma, and some seasons is not so sure a cropper as that variety. Because of its flavor is much desired as a canning or preserving berry.

Gardner (S)—Large, stocky plants; resembles the Clyde in gen-

eral appearance except it makes much larger, more robust foliage, sufficient to give perfect protection from the sun to the berries. It is very productive; it will not have as many ripe berries on at one time as the Clyde, but lasts longer, and will produce as much fruit, one season with another as the Clyde. The Clyde will produce some larger berries than the Gardner, and some smaller. The Gardner is much more uniform in shape and size and will average fully as large during the season. We use it extensively to pollenize Haverland. Mid-season.

Glen Mary (S)—Very weak in pollen not fit to pollenize pistillates. It is fairly productive of nice large berries, and holds up well during the whole season. We like this berry better each year. Mid-season; has a robust, vigorous plant; but hardly up to the average as a plant maker.

Good Luck (S)—New. "The fruit of this new berry as compared with Gandy, is equally as large, more productive, and two or three days earlier; in shape it is conical to broad conical or wedge-shaped, with uniformly smooth, even surface, never seamed or ridged; color dark glossy cardinal, making a great show both on the vines and in the package after being gathered. It ripens all over at once, with no green tips."

Greenville (P)—This is an old standard variety, well-known all over the country; it is very productive. We have never known it to fail in making a large yield of berries; like the Bubach it is classed as soft, but they ship well in refrigerator cars; a medium plant maker of fine healthy plants.

Haverland (P)—A standard variety that is more universally praised all over the country than any other. It has more good points and fewer faults than any other. It succeeds on all kinds of soil, and seems to be the least affected by frosts, often producing a full crop of perfect fruit, when other varieties are badly damaged. It makes a large stocky plant and sets just enough plants to make a perfect fruiting row. Fruit medium in season, very productive, large to very large and holds up in size to the last picking. Berries long in shape, gradually tapering and light scarlet in color. While it may not be as firm as some varieties, it is firm enough for home or nearby markets, and if not allowed to get too ripe before picking, will carry as long a distance as any variety.

Helen Gould (P)—New. Originated in Missouri. Medium to late in season; very productive of large, roundish conical fruit, glossy red in color.

Hoffman (S)—This is nearly, if not quite, as early as Michel; some seasons it is more productive and others no more productive than the Michel; one great advantage it has, it does not make much more than half the plants the Michel does, so it matures much larger and

nicer fruit. It is generally quoted on the market at from fifty cents to a dollar a crate more than the Michel, as it is larger, a better shipper and better looking berry.

Highland (P)—New. Being first introduced two years ago by the reliable plant dealers, M. Crawford Co., Cuyahoga Falls, Ohio, who expect that it will become the most popular market variety yet offered. For the last four years the Ohio Experiment Station has found this variety to be the most productive of any tested. Plants very large, strong and vigorous. Fruit medium to large, blunty conical; color bright scarlet; flesh red clear through.

Jesse (S)—An old variety that is adapted more to certain soils and localities, either as a home berry or a fancy market variety.

July (P)—Another new variety, from Michigan. Described in part by the originator as follows: "This is without doubt the latest variety grown. It does not commence to ripen until other varieties are gone. A bright red, smooth handsome berry, of fine quality and good size.

Gen. Joe Wheeler (S)—"This variety comes from the south and is supposed to be a descendent of Lady Thompson, which its foliage very much resembles. It is about equal to the Lady Thompson in size, very much resembles it in color, and more productive. It ripens early."

Johnson's Early (S)—Here is an early variety that has good parentage, being a cross of the Crescent and Hoffman. It is very early, ripening about the same time as the Excelsior. It resembles the Hoffman in color of foliage, and the fruit is very large, highly colored, and of extra fine quality. On thin land it is not very productive, and many of the blooms appear to blight; but on heavy land it is very productive, and we doubt if there is any early variety that will excel it in size and attractivenes of fruit. It is a very prolific plant maker, and probably no other variety can equal it in this respect, therefore it is necessary to keep plants thinned for best results. Firm, a good shipper. If you have not tried the Johnson, we would advise a trial.

Klondike (S)—This is a variety that from reports and our own observations, we believe is a decided improvement over the well-known Lady Thompson. The Lady Thompson has been well proven, and during dry seasons especially has been a money-maker, for then it seems to do the best. But it is too light in color, and during a wet season gets soft. We have found the Klondike not to have these bad qualities. The Klondike is a good plant maker of dark colored clean foliage, as productive, if not more so, than the Lady Thompson and two or three days later in ripening. The fruit is of good size, though not extra large, but holds up well in size and lasts a long season. Regular

in shape, dark red in color and firm. In fact, is reported to carry extra well as a shipper. Probably no berry came so quickly to the front among southern growers as a market variety.

Lady Thompson (S)—The well-known southern variety where it is largely planted. A good plant maker and fairly productive of medium sized, light colored fruit. It is second early in ripening and lasts a long season. It seems to thrive and do best during a dry fruiting season, apparently the drier it is the better it seems to do.

Louis Hubach (S)—A seedling of Warfield and Lady Thompson. An extra good plant maker and early in ripening. The fruit is of good size, very firm and quite productive. Said to stand drouth best of any kind.

Lyon (P)—A fair plant maker, medium to late in season. Productive, fruit medium, long conical, sometimes wedge-shaped. Color dark red, moderately firm.

Marshall (S)—An old variety, grown extensively by those who supply a fancy trade. Plant very large and healthy, fruit very large, roundish, and very dark, glossy red. Moderately productive and medium in season.

Mary (P)—This is an extremely large berry, but a poor plant maker, unless on strong soil and well cultivated. Fairly productive, medium to late, and very firm for so large a berry. In color it is very dark red, almost black when fully ripe. Recommended to those who cater to a fancy trade.

Mark Hanna (P)—A good plant maker and productive of very large, dark red, firm fruit. From medium to very late in season.

Meade (S)—New. Of Massachusetts origin. Strong healthy plant, vigorous foliage. "The berries are of large size, globular, uniform shape; deep glossy red color on outside and red flesh all the way through." Productive, mid-season.

Mele (P)—This is an improvement on Crescent all around and about the same season in ripening. It is a prolific plant maker, and while it cannot be classed with the large berries, it is fully as large, if not larger than the Crescent, and holds up much better to the last picking.

Michel (S)—An old variety, noted for its earliness and for being a prolific plant maker.

Mrs. Miller (P)—New. A very promising variety, if well rooted, thrifty, healthy plant growth is any indication; in fact makes about the largest plant we grow. We notice very favorable reports from this variety, whenever tried. "Fruit is very large dark red and glossy,

oblong in form, slightly flattened and of delicious flavor. It appears likely to win a position among the very best of our late varieties."

Midnight (S)—Claimed to be the very latest in ripening and thrives well and fruits abundantly on every variety of soil. Fruit large in size and firm.

Monitor (S)—A good plant maker and very productive of very large berries, uniform in shape. It is too soft for long distance shipping, but should give satisfactiou as a home or nearby market berry.

Morning Star (S)—An extra good plant maker. Foliage healthy, large and dark green. Originated in Virginia, and the introducer says, "At last we have in the Morning Star what has so long been wanted; a very early variety producing in great abundance very large and beautiful berries of the highest quality. Ten days earlier than any other variety, producing large berries, firm."

Nehring's Gem (P)—New. "Makes a healthy, thrifty plant, and is a good yielder of good sized berries; conical in shape and bright red in color. It is one of the best keepers, either on the plants or in the baskets.

New Home (S)—This is the favorite variety of Mr. W. F. Allen, the large strawberry grower of Maryland, and who grows more of it than all other varieties combined for market. He says: "As late and large as Gandy, fruit a bright red color that does not lose its lustre, and turn dark after being picked a long time. Uniform large size and the best shipping and keeping berry grown. Vigorous grower and unlike Gandy will produce a large crop on either high or low land. So firm that it does not need to be picked oftener than three times a week, and for market that can be reached within twelve to twenty-four hours twice a week is sufficient." The plant growth has been very vigorous with us this season, making thrifty, clean foliage of light color.

New York (S)—An average plant maker; plants large, foliage very healthy. It is a cross of Bubach and Jessie. Medium in season and very productive of large sized fruit. A berry highly spoken of wherever tried. Not extra firm, but especially recommended by the introducer for a local market or a market that can be reached over night.

Nick Ohmer (S)—"Productive of large, dark red, globular berries, highly colored all the way through. A grand market berry and also, a superb variety for the home table. Responds better to high culture and extra attention. Mid-season."

North Shore (S)—New. A good healthy plant maker. "The fruit is large, round and smooth, dark red with red flesh. Season medium."

Oak's Early (S)—Originated in Maryland and named on account

of its season, and having been discovered near a large oak stump. "Comes in with Michel and Hoffman and resembles the latter celebrated variety but far superior to it in many respects, being much stronger in growth and three times as productive." A very good plant maker of healthy dark colored foliage.

Oom Paul (S)—Rather new. A very healthy plant maker. Productive of large sized fruit, dark red in color inside and out. The flesh is quite and of good quality.

Parson's Beauty (S)—This variety is vigorous in plant growth with clean, thrifty foliage, and with us last season was the most productive of any variety; did not seem to be materially injured by the late freezes. Fruit medium to large, very dark red all through but too soft for distant shipping. For a close market should be a valuable variety.

Parker Earle (S)—A very productive berry if all conditions are favorable, otherwise it will prove a failure. It must have a very rich soil and plenty of moisture to mature its crop; when conditions just suit it is immense. Does not make many runners, but has a tendency to stool from the mother plant.

Phillip's Seedling (S)—We were very much impressed with this variety last season. It is a good plant maker of medium size plants. The fruit is from medium to large in size, of good color, conical and regular in shape, but slightly corrugated. It is productive, very firm and seems to hold up well in size. Mid-season.

President (P)—Makes a very vigorous plant. Fruit very large and holds up in size to the last picking. Round in shape, dark red glossy and remarkably firm. Mid-season to late.

Pride of Cumberland (S)—A fair plant maker, with large, dark foliage. "Like Gandy, this berry will carry from Florida to Boston. It is brilliant red in color, and holds its freshness and lustre longer than most other varieties. It thrives on any soil, but owing to its immense crop, better results are obtained by putting it on rich land. The fruit is equal to Gandy in every respect, better in quality, and ripens one week earlier."

Pride of Michigan (S)—Introduced from that state. Very productive, second early in season, and fruit firm and dark red clear through. In size and shape large and rather oblong, resembling Haverland in those respects. Foliage vigorous and a good plant maker.

Red Bird (S)—Originated in Mississippi, a cross between Murray and Hoffman, both extra early market berries. The foliage is somewhat similar to Hoffman, but much more vigorous in growth. It is said to be

large, of good flavor, very productive, and an excellent shipper. Very early, ripens with Excelsior, and superior to it in every way.

Ridgeway (S)—This variety succeeds well in nearly every part of the country. It is very productive, and though it is not extremely large, it is large enough to go as a fancy berry on any market. It is the most uniform in shape and size of any berry we grow. The calyx is large and the most beautiful tint of green to suit the glossy deep red coloring of the berry. It has a fine flavor and ripens from mid-season to very late. We use it extensively as a late fertilizer for pistillates as it is extra potent in pollen.

Rough Rider (S)—This is a good sized dark red, medium to late berry. Well liked in some localities, but is rather a slow plant maker.

Sample (P)—A very productive berry, medium to late in ripening; in fact it should be classed as late, as more of its berries ripen in that season. A good plant maker, of strong thrifty plants. Fruit above the medium in size, firm nice color and holds up well for a long season. Since we have noticed this berry it has gained in prominence each year. This berry will compare well with Aroma in the color and size of its fruit; it is not quite so round, but has more of a conical shape.

Senator Dunlap (S)—A variety that seems to give general satisfaction all over the country. It is a perfect bloomer and an extra prolific plant maker of medium size plants; medium in fruiting season, ripening about the same time as Warfield and resembling that variety in color and shape of fruit. The Dunlap is very productive, medium to large in size and very dark red when fully ripe. It is firm and has a peculiarity of remaining on the vines longer after ripening than most varieties without becoming soft. It seems to do well on all kinds of soil and in all sections. It is especially highly spoken of by northern growers, where it is exclusively grown. Plants should be set twelve to eighteen inches farther apart than Aroma or Haverland, or runners kept cut off, to get best results in size of fruit, for it is almost the best plant maker we have.

Shuster Gem (P)—This is an early pistillate variety ripening about the same time as Crescent. Its fruit will average larger than Crescent, although some of the first berries are irregular in shape. A good plant maker, very productive and holds up better in size and lasts longer than Crescent. Some growers have found it a profitable berry to raise here.

Splendid (S)—An old variety. A good plant maker, very productive, and especially good as a mid-season pollenizer.

St. Louis (S)—New, from Arkansas. Originated and introduced by J. A. Bauer, who has introduced so many well-known varieties. Mr. Bauer says he is very proud of the St. Louis, for he thinks it is

the largest early berry grown. Plants have very thrifty light colored foliage that lies close to the ground, and the root growth is extra fibrous. He says: "Berry is large as an early berry we have grown; we have picked twelve berries which made a quart well filled. Ripens with Klondike, is larger than Climax, Lady Thompson, Excelsior or any other early kind we have grown. Firm, finest of flavor."

Son's Prolific (S)—A new berry. Originated in Missouri. Late in season and superior to Aroma. Originator's description: "The Son's Prolific is a berry I originated from Bubach, fertilized with Aroma in 1902, and have fruited it seven years. Without exception it is the best shipper, best colored and best plant I ever saw, and I have tried nearly all the old and new varieties of merit I could find. It is a berry without fault in fruit or plant. Berry large to very large color brilliant red, much higher colored than Aroma. When fully ripe a true pineapple flavor; nothing equals it in this particular quality. Plant large and a good plant maker with a heavy root system. The berries simply lay in piles around the plants. I have picked from seven to thirteen berries from one plant at one picking just in right stage for shipping."

Steven's Late Champion (S)—Most probably a descendent of Gandy, but it is considered a much better grower on a greater variety of soils. The fruit is large, long, a little flattened and bright red in color.

Sutherland (P)—Originated in New York. Claimed to be a very productive of early berries of large size. As a market berry and for home use cannot be equaled.

Tennessee Prolific (S)—It is both prolific in plants and fruit; a very healthy, robust plant, a good pollenizer for mid-season pistillates. We deem it one among the best of our old varieties.

Texas (S)—This is a new variety, introduced by the same man that originated the Excelsior. It resembles the Excelsior in foliage and growth, but is not as prolific in plants and does not rust. We have fruited it for five years, and like it better every season. It is nearly as early as the Excelsior, but does not ripen quite as fast; fully as large or larger, lasts a long time for so early a berry and produces more marketable fruit than any early berry we have grown. Many of the berries at the last picking are as large as the first ones. It is almost round in form, and makes a good appearance when crated.

Virginia (P)—New. An early variety ripening soon after Excelsior. A good plant maker, very productive, and of an uniformly large size for an early berry. It is firm enough to make a good shipper,

and of a bright glossy red color. Highly recommended by the introducer as a profitable early variety.

Warfield (P)—This was the leading berry in this section of the country for many years, and although not planted as extensively as it once was, quite a large acreage of the Warfield is planted each year yet. It is one of the best plant makers, and very productive. The first berries are large in size but if the rows are too thick, or if it is not properly pollenized, the berries will soon get too small and knotty for a market berry. Some years on certain soils, under favorable conditions, it will produce as many crates to the acre of marketable berries as any variety. It is deep red in color; firm and especially desired as a canning berry. If it is kept properly thinned it would be more of a desirable variety, but as it is generally grown there are too many small berries to be profitable.

THE MISSOURI STATE BOARD OF HORTICULTURE MAILING LIST.

Upon the following pages are given the list of names appearing upon our office mailing list to whom the annual reports of the Missouri State Board of Horticulture and also special bulletins are sent as published.

Missouri.—We do not claim to have the names of all the fruit growers of Missouri by any means, and we are aware of the fact that not all of the people in our Missouri list are engaged in fruit growing, but all citizens of the State who are taxpayers are entitled to receive our literature if they desire it, whether they grow fruit or not. A little later on we hope to be able to classify this list so that any one can tell at a glance whether any name represents an orchard owner or simply one who is interested in reading horticultural literature.

We are now engaged in the gigantic task of making an orchard or tree census of the State, but this work will not be complete for several months. When this is done we hope to publish the names of all orchard owners, together with their acreage of trees, etc., kinds of fruits and extent of each variety.

Foreign List.—For various reasons we carry a great many names upon our mailing list from outside of Missouri. A large number of people residing in other states own or expect to own fruit lands in Missouri. Also, for years past, as at present, numerous persons in all the adjoining states fraternize with our horticulturists and attend our meetings, and we reciprocate. We exchange literature with other boards and societies, experiment stations and publishers of horticultural periodicals all over the United States and foreign countries. Finally, we send our reports to quite a number of the leading libraries throughout this country and abroad.

Correct Us.—We welcome corrections in spelling of names of persons, towns, etc., or in fact, any errors in addresses, no matter how small they may be. Few people realize how many mistakes always creep in every time such a long list of names is copied. Please help us to keep the list correct.

MISSOURI.

For convenience, the list of names from Missouri is classified by counties, as follows:

ADAIR.

Balch, Lake, Youngstown.
Barnes, A. H., Kirksville.
Beardslee, S. C., Kirksville.
Brashear, Eugene, Kirksville.
Brashear, R. M., Kirksville.
Buchanan, B. E., Kirksville.
Beecher, Phil., Route 1, Kirksville.
Burns, A. H., Kirksville.
Cain, Geo., Novinger.
Cole, Thos. A., Youngstown.

Conner, Arthur, Kirksville.
Daugherty, Mrs. L. S., Kirksville.
Dickson, Chas., Kirksville.
Fickel, Thos., Kirksville.
Foncanon, Miss Sarah, Kirksville.
Ford, W. M., Kirksville.
Frisbee, R. B., Kirksville.
Fuller, W. R., 915 S. Davis St., Kirksville.
Gehrke, Carl, Kirksville.
Gibbons, Miss Lizzie, Kirksville.
Goonis, G. W., Kirksville.
Hacker, J. T., Kirksville.
Harvey, Mrs. H. C., Kirksville.
Higbee & Mills, Kirksville.
Higbee, Paul, Kirksville.
Holmen, J. D., Yarrow.
Imbler, T. W., Kirksville.
Johnson, G. W., Kirksville.
Kellog, E., Kirksville.
Klingman, Pauline, Grain Valley.
Knapp, Geo. W., 114 Porter Ave., Kirksville.
Lathan, Albert, Yarrow.
Linder, Edmund, Kirksville.
Loomis, G. W., Kirksville.
Lorton, L., Kirksville.
Lowe, Andrew, Kirksville.
Ludden, D. H., Kirksville.
McCall, Luther C., 501 Hickory St., Kirksville.
McFetridge, Wm., Novinger.
May, J. E., Kirksville.
Mitchell, Mrs. Mariam R., Kirksville.
Moots, L. F., Kirksville.
Music, S., Kirksville.
Nichols, Geo., Kirksville.
Nichols, Henry, Kirksville.
Novinger, I. A., Kirksville.
Otto, Chas., Youngstown.
Painter, C. C., Kirksville.
Patterson, John, Kirksville.
Pevehouse, F. A., Brashear.
Prosser, G. A., Box 118, Kirksville.
Rainwater, J. M., Kirksville.
Ridgeway, G. W., Kirksville.
Shoop, Jacob, Novinger.
Sibole, J. N., Route 1, Novinger.
Simler, J. S., Route 1, Youngstown.
Sinele, F. C., Gibbs.
Smith, R. B., 608 West Barton Ave., Kirksville.
Stokes, J. S., Kirksville.
Thompson, Orion, Kirksville.
Trimmer, E. A., Kirksville.
Waddell, J. T., Kirksville.
Ward, Roy, Route 6, Kirksville.
Warner, A. B., Kirksville.
Wilkins, Al., Yarrow.
Woods, L. P., Kirksville.
Young, Geo., Youngstown.

ANDREW.

Balli, Chris, Amazonia.
Bottorff, Chas., Box 441, Savannah.
Cole, Ira B., Route 1, Rosendale.
Havner, E. L., Rosendale.
McCallon, W. H., Rosendale.
Montgomery, Tom, Bolckow.
Savell, Leroy, Savannah.
Stewart, John C., Savannah.
Zimmerman, A. W., Amazonia.

ATCHISON.

Angel, Thos., Tarkio.
Bickel, Martin, Rockport.
Boettner, Harrison, Route 1, Rockport.
Boettner, Wm., Rockport.
Carpenter, W. P., Tarkio.
Craig, A., Tarkio.
Franklin, B., Watson.
Fraub, Fred., Rockport.
Giermann, W. E., Rockport.
Hall, John, Rockport.
Hall, B. E., Watson.
Hanna, J. F., Tarkio.
Linn, Robt., Tarkio.
Low, A. R., Tarkio.
McCartney, W. W., Rockport.
Million, F. M., Rockport.
Moore, Henry, Watson.
Munich, Chas., Rockport.
Oswald, Jno., Rockport.
Rankin, E. F., Tarkio.
Rankin, D. C., Tarkio.
Rankin, D., Tarkio.
Rhoades, J. H., Tarkio.
Schooler, F. H., Rockport.
Stapel, H. F., Rockport.
Steck, Geo., Rockport.
Stickerod, C., Rockport.
Stones, Jno., Watson.
Walters, Geo. A., Rockport.
Wolf, J. H., Rockport.
Wyatt, A. E., Rockport.
Zuck, W. L., Rockport.

AUDRAIN.

Atchison, Edgar, Route 3, Laddonia.
Barries, Noble, Mexico.
Bassford, W. D., Mexico.
Bell, J. R., Mexico.
Cauthorn, Dode, Mexico.
Clark, Chas., Mexico.
Clark, J. E., Route 2, Benton City.
Crawford, Jas. J., Molino.
Frazier, Wm., Mexico.
Hanger, John, Rush Hill.
Johnson, W. Clyde, Route 1, Vandalia.
Johnson, W. D., Vandalia.
Kent, Lenley R., Wright City.
Kent, W. L., 431 Franklin Ave., Mexico.
Layson, Mr., Mexico.
Malone, S. M., Mexico.
Malone, Wm., Mexico.
Mason, Wm., Mexico.
Metcalf, Jas., Mexico.
Rouse, J. W., Mexico.
Shoube, J. L., Laddonia.
Smith, J. M., Mexico.
Smith, Judge J. W., Mexico.
Strange, Walter M., Route 1, Mexico.
Treloar, Percy, Mexico.
Ware, Joe, Mexico.
Waters, S. A., Route 5, Vandalia.
Weaver, J. W., Molino.
Weaver, Wm., Molino.
Williams, Jacob, Laddonia.
Wilkerson, K. B., Mexico.
Winter, Ed., Mexico.
Winter, E. J., Mexico.

BARRY.

Ackerson, Jas., Monett.
Ackerson, Nels., Monett.
Adcock, W. B., Washburn.
Anthony, Walter, Monett.
Antle, Wm., Exeter.
Apple, C. E., Seligman.
Ault, P. T., Washburn.
Balley, Eli, Monett.
Balmas, J. P., Monett.
Balmas, Steve, Monett.
Barnes, Jeff., Seligman.
Barnes, J. M., Seligman.
Barnes, V. L., Seligman.
Barr, Roby, Exeter.
Beaman, F. D., Washburn.
Beamvis, Fred, Washburn.
Bear, C. L., Monett.
Berryhill, J. D., Washburn.
Black, C. C., Washburn.
Black, W. H., Washburn.
Black, W. L., Washburn.
Bowyer, E. A. O., Cassville.
Boynton, F. W., Box 507, Monett.
Brendlinger, J. E., Monett.
Brendlinger, W. F., Pierce City.
Bridgman, James, Exeter.
Brite, D. E., Monett.
Brittenham, J. R., Washburn.
Bryant, Harvey, Golden.
Buchanan, A. S., Purdy.
Builteman, H. G., Purdy.
Burg, Brewer, Purdy.

Burg, J. B., Purdy.
Burton, O. F., Purdy.
Cable, Dan, Monett.
Cagle, W. E., Purdy.
Caldwell, C. C., Monett.
Call, Jas., Purdy.
Cargile, Early, Washburn.
Cargile, John, Washburn.
Cates, John, Butterfield.
Chadd, A. C., Washburn.
Chappell, Ben, Mano.
Chastain, J. F., Route 3, Purdy.
Clanton, F. M., Seligman.
Clark, W. H., Purdy.
Colburn, A., Washburn.
Collier, T. D., Seligman.
Combs, Emil, Monett.
Cosby, Wiley, Purdy.
Courdin, Steve, Monett.
Courey, Will, Monett.
Coutant, L., Route 2, Monett.
Cowherd, W. D., Route 4, Purdy.
Crawford, B. F., Purdy.
Cuendet, Ami, Monett.
Dalton, Press, Washburn.
Davis, D. D., Washburn.
Davis, L. M., Monett.
Davis, Phil., Monett.
Davit, Dan, Monett.
Dennis, W. H., Monett.
Denton, F. A., Washburn.
Doyle, S. H., Exeter.
Drake, A. B., Monett.
Dummitt, F. R., Monett.
Earle, Geo., Cassville.
Ellis, W. N., Exeter.
England, J. A., Cassville.
Etter, Jas., Monett.
Fairchild, Wm., Washburn.
Fairchild, W. A., Route 1, Seligman.
Fawver, J. C., Seligman.
Fawver, J. M., Seligman.
Fleetwood, T., Monett.
Foster, Thos. J., Washburn.
Fritz, John, Jr., Route 3, Monett.
Frost, W. W., Seligman.
Gaylon, Tom, Seligman.
Goetz, P. M., Monett.
Goodnight, L. C., Purdy.
Gottes, Andrew, Monett.
Gray, H. M., Butterfield.
Gulies, Wm., Washburn.
Gulick, L., Purdy.
Gurley, J. M., Purdy.
Hadd, A. C., Washburn.
Hagler, J. A., Monett.
Hall, Geo., Exeter.
Hamilton, Creed, Mineral Springs.
Hamilton, Wm., Washburn.
Hancock, Wm., Washburn.
Hanna, H. T., Washburn.
Harper, A. P., Purdy.
Harper, Jas., Purdy.
Harris, J. H., Washburn.
Harrison, A. H., Monett.
Harvey, H. T., Exeter.
Hathaway, W. C., Monett.
Hemphill, H., Purdy.
Henderson, Mrs. A. J., Washburn.
Henry, Ike, Washburn.
Henry, John, Washburn.
Hickey, T. H., Washburn.
Hickox, O., Washburn.
Hilker, Harry, Washburn.
Hoag, John, Washburn.
Hopkins, David, Pioneer.
Hopkins, J. B., Washburn.
House, Jas., Cassville.
Howerton, J. A., Route 4, Purdy.
Horine, C. W., Route 3, Purdy.
Hutchinson, D. T., Washburn.
Iden, Mrs. M. S., Monett.
Irby, B. F., Roark.
Jackson, C. H., Monett.
Jacques, John, Monett.
Jacques, W. A., Monett.
Jayne, C. N., Washburn.
Jenks, A. L., Monett.
Jennings, B. W., Route 4, Purdy.
Johnson, T. G., Exeter.
Jones, C. W., Exeter.
Jones, Patent, Washburn.
Kaiser, H. R., Route 2, Monett.
King, R. C., Cassville.
Lane, J. M., Purdy.
Lane, U. S., Purdy.
Lane, Wilson, Purdy.
Lansdown, R. S., Route 4, Purdy.
Lawrence, J. M., Washburn.
Lewis, Arch, Exeter.
Lewis, Dane, Purdy.
Lewis, D. R., Purdy.
Lucky, Monroe, Exeter.
Lucky, N. J., Exeter.
Maine, B. F., Washburn.
May, Harry, Exeter.
Mayhew, J. W., Route 3, Monett.
Mayhew & Winton, Monett.
McClure, Sam, Seligman.
McComac, Reames, Washburn.
McCormick, W. T., Monett.
McIntosh, Jas., Purdy.
McKee, T. J., Route 4, Purdy.
McPeak, W. M., Monett.
Mermoud, J. F., Route 2, Monett.
Mitchell, J. M., Seligman.
Mizer, J. M., Purdy.
Moffatt, P. R., Washburn.
Morgan, J. G., Washburn.
Mosley, J. H., Washburn.
Mourand, John, Monett.
Mourglia, John, Monett.
Murray, H. M., Seligman.
Mutrax, Chas., Route 2, Cassville.
Nickle, D. M., Butterfield.
Osborne, A. R., Seligman.
Osborne, Wm., Seligman.
Pallett, Wm., Washburn.
Palmer, A. B., Route 4, Purdy.
Parks, Jas., Washburn.
Payne, C. A., Route 4, Purdy.
Payne, M. L., Seligman.
Pease, J. A., Washburn.
Pendergraft, Geo., Seligman.
Pennell, J. T., Route 4, Purdy.
Phillips, John W., Hailey.
Phillips, Vol., Washburn.
Planchon, J. P. G., Monett.
Prier, J. W., Route 4, Purdy.
Prier, R. W., Purdy.
Ray, Ben, Butterfield.
Ray, T. J., Butterfield.
Ray, Walter, Butterfield.
Ray, W. B., Cassville.
Redding, Mrs. H. A., Monett.
Reed, A. J., Exeter.
Rhea, H. M., Route 4, Purdy.
Rhea, Mrs. Mattie, Route 4, Purdy.
Riddle, R. W., Purdy.
Robertson, Gus., Purdy.
Rockhill, Cyrenius, Monett.
Roller, Arthur, Seligman.
Roller, P., Washburn.
Roller, F. C., Seligman.
Roller, J. A., Seligman.
Roller, James, Washburn.
Roller, Jake, Washburn.
Roller, S. M., Purdy.
Roller, Robt., Seligman.
Rose, Sam, Washburn.
Rouse, Frank, Purdy.
Rubow, C. W., Seligman.
Ruddick, J. F., Cassville.
Scoles, Mrs. M. T., Washburn.
Scott, G. B., Monett.
Selvedge, W. C., Purdy.
Sexton, John, Route 4, Purdy.
Shell, J. S., Purdy.
Shore, E. W., Cassville.
Stapleton, S. P., Exeter.
Stephens, Eli, Washburn.
Stewart, Bob, Purdy.
Strong, W. H., Seligman.
Strother, J. W., Cassville.
Stubblefield, Clay, Exeter.
Stubblefield, R. L., Exeter.
Sullivan, John, Washburn.
Talbert, D., Exeter.

Talbert, Jesse, Exeter.
Terry, M. F., Purdy.
Terry, M. G., Purdy.
Terry, M. M., Purdy.
Thomas, W. W. Washburn.
Traughber, R. D., Monett.
Tucker, J. A., Purdy.
Underwood, W. A., Monett.
Utter, D. A., Cassville.
Vanhorn, J. L., Butterfield.
Vaught, Curtis, Purdy.
Vermillion, B., Monett.
Vermillion, John, Monett.
Vermillion, L. D., Monett.
Vermillion, Reas, Monett.
Wagoner, Lewis, Purdy.
Wardlane, W. M., Seligman.
Weathers, A. W., Washburn.
Weisman, W. A., Monett.
West, J. L., Exeter.
Westmorland, A. S., Washburn.
Whittington, F. S., Purdy.
Whittington, Rev. N. M., Route 4, Purdy.
Williams, C. A., Purdy.
Wilson, E. S., Monett.
Wilson, R. C., Monett.
Wilson, Z. M., Purdy.
Windes, B. F., Washburn.
Winsatt, H. and M., Monett.
Witte, Julius, Monett.
Woodruff, A. H., Washburn.
Wormington, C. M., Purdy.

BARTON.

Andrews, Schuyler, Lamar.
Bare, W. L., Golden City.
Beamer, Joe S., Lamar.
Dickson, A. M., Golden City.
Divine, W. B., Lamar.
Fry, L. W., Irwin.
Fry, Geo. A., Irwin.
Mardick, A. E., Golden City.
Nelson, Chester A., Mindenmines.
Price, Mrs. John T., Mindenmines.
Selvey, Roy, Route 3, Lamar.
Sorden, John, Route 5, Lamar.
Stacy, John, Liberal.
Stemmons, W. F., Golden City.
Sturdevant, James, Lamar.
Warner, W. G., Lamar.

BATES.

Benham, J. J., 207 Atkenson Ave., Butler.
Black, E. E., Butler.
Clawson, Albert, Adrian.
Cole, Mark E., Route 1, Rich Hill.
Denton, J. C., Adrian.
Durand, J. B., Rockville.
Ellis, Howard A., Butler.
Gentry, G. F., Merwin.
Glassmire, C. L., Amoret.
Marquaredt, Theo., Rockville.
Mills, Ben, Merwin.
Morrison, W. F., Adrian.
Pry, A. J., Route 8, Butler.
Riddell, J. F., Amoret.
Shumaker, H. G., Amoret.
Spurrier, Jesse, Amsterdam.
Sutton, Ira L., Butler.
Sylvester, J. M., Route 2, Hume.
Vansant, W. E., Route 1, Butler.

BENTON.

Babcock, O. L., Ionia.
Brandt, John, Cole Camp.

BOLLINGER.

Caldwell, Jos. W., Marble Hill.
Conrad, C. V., Lixville.
Engelen, Henry, Leopold.
Feller Bros., Marble Hill.
Gladish, M. S., Lutesville.
Long, Albert, Patton.
Long, Richard, Patton.
Morgan, W. M., Marble Hill.
Miller, E., Sedgewickville.
Winters, J. F., Laflin.

BOONE.

Anderson, Sam J. P., Sturgeon.
Atkins, T. E., McBaine.
Ballenger, J. F., McBaine.
Ballenger, T. J., McBaine.
Baker, S. H., 712 Maryland Place, Columbia.
Ballew, T. T., Route 2, Columbia.
Balmyer, J. E., McBaine.
Bast, N., Route 2, Sturgeon.
Baumgartner, Jos., Route 2, Columbia.
Davis, Earl, Route 8, Box 146, Columbia.
Ellis, Geo. B., care Farmer & Breeder, Columbia.
Fellows, J. N., 907 College Ave., Columbia.
Gueugerich, J. P., Centralia.
Hagan, L. T., Columbia.
Hampton, J. B., Centralia.
Hampton, Dr. Z. M., Centralia.
Hill, R. L., 1000 Locust St., Columbia.
Hulen, D. M., Hallsville.
Jesse, Dr. R. H., 810 Hill Crest Ave., Columbia.
Makon, J. B., McBaine.
McMiller, A. T., Columbia.
McQuitty, Alvin, Route 5, Columbia.
Missouri Agricultural College Farmer, Columbia.
Niemann, Louis, Columbia.
Palmer, Chas. P., Sturgeon.
Parker, E. C., care Statesman, Columbia.
Roberts, Geo. W., Rocheport.
Robnett, D. A., 1509 E. Broadway, Columbia.
Roby, O. C., Rocheport.
Rodhouse, Prof. T. J., 819 Virginia Ave., Columbia.
Shock, C. E., Centralia.
Smoot, B. P., Centralia.
Steenberger, Isaac Van Meter, Woodlandville.
Stocks, Zeno, Westwood Ave., Columbia.
Terrill, A. W., 1111 University Ave., Columbia.
Tow, Thos., Browns Station.
Tucker, Talmadge T., Hallsville.
Winkelhake, H. T., Centralia.

BUCHANAN.

Berry, G. D., Route 1, St. Joseph.
Bloomfield, A. W., 1001 Logan St., St. Joseph.
Butler, H. E., Route 1, South St. Joseph.
Campbell, W. G., The Fruit Grower, St. Joseph.
Connett, Squire S., South St. Joseph.
Cooksley, S. B., 316 N. 18th St., St. Joseph.
Cox, S. N., 2602 Lafayette Ave., St. Joseph.
Davis, I. G., DeKalb.
Dittemore, Geo. H., Route 1, South St. Joseph.
Dobbins, William, 510 German-Amer. Bk. Bldg., St. Joseph.
Favor, E. H., The Fruit Grower, St. Joseph.
Ferguson, C. G., 1305 Atchison St., St. Joseph.
Fruit Grower, St. Joseph.
George, R. L., Easton.
Good, Mrs. Wesley, 1910 S. 24th St., St. Joseph.
Harris, Harry C., Route 2, Faucett.
Hartman, L. J., Route 3, St. Joseph.
Homan, G. S., Easton.
Irvine, J. M., The Fruit Grower, St. Joseph.
Karrasch, F. W., Route 3, St. Joseph.
Marshall, Elliott, St. Joseph.
Martin, H. C., DeKalb.
Maxwell, W. D., Route 2, South St. Joseph.
May, L. D., DeKalb.
McDannold, W. A. P., St. Joseph.
Meek, Mrs. Nellie, 1111½ Frederick Ave., St. Joseph.

Minter, Jno. L., Route 1, South St. Joseph.
Nelson, H. J., 404 S. 3rd St., St. Joseph.
Onstott, Robert, Route 1, South St. Joseph.
Randolph, K. B., German-Amer. Bk. Bldg., St. Joseph.
Rau, R. G., Supt. City Parks, St. Joseph.
Samuel, A. G., St. Joseph.
Sawyer, Rev. H. A., 1024 N. 13th St., St. Joseph.
Squires, H. A., Inza, Mo.
Strong, J. P., Ed. Daily Courier, St. Joseph.
Turner, D. A., Sr., Sta. D., 5603 King Hill Ave., St. Joseph.
Utz, R. E. Lee, Route 1, South St. Joseph.
Wilcox, J. F., Route 2, St. Joseph.
Wilke, D. C., 2707 Pattee St., St. Joseph.
Wilson, W. J., Route 2, St. Joseph.
Work, Chas., The Fruit Grower, St. Joseph.

BUTLER.

Hudelson, J. W., 327 North B St., Poplar Bluff.
Reed, H. E., Hendrickson.
Sawyer, C. H., Sawyer.
Woodstock Implement and Mfg. Co., Sawyer.

CALDWELL.

Estabrook Bros., Breckenridge.
Hare, T. H., Hamilton.
Jones, C. R., Nettleton.
McCray, J. W., Cowgill.
McCray, Wm., Cowgill.
Morris, W. W., Route 6, Braymer.
Page, H. M., Breckenridge.
Prentice, Gid, Hamilton.
Wartz, Chas., Hamilton.

CALLAWAY.

Beasley, Isham, Route 1, Tebbetts.
Bell, John P., 821 Bluff St., Fulton.
Britts, J. B., Route 2, Fulton.
Burt, Huron, Route 1, Calwood.
Calvin, R. T., Steedman.
Crowson, J. D., Fulton.
Crowson, J. H., Route 8, Fulton.
Davis, Geo., Route 8, Fulton.
Delo, W. C., Route 8, Fulton.
Erwin, J. L., Fulton.
Erwin, James O., Steedman.
Fourt, W. C., Fulton.
Gill, Harry, Portland.
Gingerich, Otto, Route 8, Fulton.
Howison, Rev. W. T., Route 2, Fulton.
Irvine, G. W., Cedar City.
Lenoir, Jas. C., Fulton.
McCracken, O. Route 2, Fulton.
McIntire, J. W., Fulton.
Moore, J. W., Readsville.
Murphy, R. T., New Bloomfield.
Redden, J. W., Mokane.
Strickland, Felix, Mokane.
Stucker, H. H., Mokane.
Wallace, H. B., Fulton.

CAMDEN.

Archer, Miss Marion, Stoutland.
Blackburne, Chas., Route 1, Stoutland.
Burhans, Junie W., Stoutland.
Burke, J. A., Route 2, Stoutland.
Burke, Wm., Stoutland.
Campbell, Jack, Stoutland.
Capps, J. D., Route 1, Stoutland.
Cook, Herman, Decaturville.
Cross, Daniel, Stoutland.
Davis, Jas. Allen, Stoutland.
Davis, W. C., Stoutland.
Dyerson, C. W., Montreal.
Eaton, Mrs. R. E., Stoutland.
Ellis, E. A., Stoutland.
Evans, Andrew, Stoutland.
Evans, Ephram, Route 2, Stoutland.
Evans, Henry, Route 2, Stoutland.
Evans, Martin, Route 1, Stoutland.
Evans, Monroe, Route 2, Stoutland.
Franklin, L. V., Stoutland.
Fullbright, L. F., Stoutland.
Hillhouse, Geo., Route 3, Stoutland.
Honey, John, Stoutland.
Irby, B. F., Roach.
Jordan, Jack, Stoutland.
Kennedy, P., Stoutland.
King, Ben T., Climax Springs.
Kissinger, Albert, Route 2, Stoutland.
Knapp, E. E., Route 2, Stoutland.
Lauder, Tom, Stoutland.
Leslie, Oliver, Stoutland.
Mellon, J. H., Stoutland.
Miller, W. W., Route 2, Stoutland.
Monday, Hyram, Stoutland.
Odell, Caleb, Stoutland.
Pate, J. M., Climax Springs.
Phillippi, John, Stoutland.
Price, Andy J., Stoutland.
Proctor, Chas., Stoutland.
Rogers, E. J., Stoutland.
Rogers, Huston, Stoutland.
Rogers, Jno. C., Stoutland.
Schofield, Wm. J., Stoutland.
Sisk, V. G., Stoutland.
Sweeney, W. E., Stoutland.
Thompson, Kelly, Stoutland.
Upton, Wm., Spring Valley.
Warmholtz, H., Decaturville.

CAPE GIRARDEAU.

Cockefair, E. A., State Normal, Cape Girardeau.
Daily Republican, Cape Girardeau.
Davidson, Geo. F., Cape Girardeau.
Hente, Theo., Route 1, Neelys Landing.
Ische, Louis, Route 3, Cape Girardeau.
Johnson, L. R., Cape Girardeau.
McDonnald, Jas. T., Jackson.
Miller, F. H., Appleton City.
Neidling, Lewis, Route 1, Egypt Mills.
Nothdurft, Wm., Jackson.
Linson, U. B., Cape Girardeau.
Lewis, T. H., Route 4, Cape Girardeau.
Perry, Edmond, Neelys Landing.
Trissell, N. C., Box 574, Cape Girardeau.

CARROLL.

Alt, Daniel, Norborne.
Atherton, Wm. M., Carrollton.
Atwood, F. E., Carrollton.
Atwood, J. S., Carrollton.
Baird, Ellis, Carrollton.
Burger, C. M., Route 2, Carrollton.
Cherry, C. O., Route 6, Norborne.
Cooper, J. C., Carrollton.
Creel, E. A., Carrollton.
Crispin, E. P., DeWitt.
Crowder, J. L., DeWitt.
Cunningham, C. A., Carrollton.
Dawson, E. F., Carrollton.
Duncan, W. E., Carrollton.
Ely, Herndon, Carrollton.
England, Jas., Route 3, Wakenda.
Estle, Mrs. E. E., Carrollton.
Farnham, E. E., Carrollton.
Fretz, J. W., Bosworth.
Furry, Isaac, Carrollton.
Gentry, R. I., Carrollton.
Gowing, Marcus, DeWitt.
Heartsell, G., DeWitt.
Heins, Emil, Carrollton.
Higginbotham, J. W., Carrollton.
Hollister, Nathan, DeWitt.
Lozier, R. F., Carrollton.
Metcalf, Western, Carrollton.
Miller, W. E., DeWitt.
Minnis, R. B., Carrollton.
Minnis, Smith, Carrollton.
Minnis, W. B., Carrollton.
Mitchell, Clarence, Carrollton.
Neil, Mrs. W. A., Carrollton.
Rodgers, W. B., Wakenda.
Rose, T. B., Carrollton.

Rowold, Fred C., Route 6, Carrollton.
Russell, Mrs. D. B., Carrollton.
Senger, Fred, DeWitt.
Taylor, B. Orlando, Bosworth.
Turner, S. K., 516 Jefferson Terrace, Carrollton.
Tweedy, T. I., Carrollton.
Wagaman, J. C., Carrollton.
Welch, J. P., Carrollton.
Welch, O. T. Carrollton.
White, Thos. D., Route 1, Norborne.
Williamson, H. P., Carrollton.
Winfree, Chas., DeWitt.
Winfrey, Peter, DeWitt.
Woodson, L. H., Carrollton.

CARTER.

Carnahan, Robt., Ellsinore.
Carnahan, Thomas, Ellsinore.
Davis, M. R., Ellsinore.
Edington, W., Ellsinore.
Link, Alfred, Ellsinore.
Long, John, Ellsinore.
Longbottom, Jas., Ellsinore.
Lowe, Wm., Ellsinore.
Maline, B. A., Grandin.
Moreland, John, Ellsinore.
Shinn, Levi, Route 1, Grandin.
Smith, Jas., Ellsinore.
Sotherland, Wm., Ellsinore.
Tipton, Sam., Grandin.
Tipton, Wheelam, Grandin.
Tucken, Henry, Ellsinore.
Webb, Eli, Grandin.
Webb, Frank, Grandin.

CASS.

Blevins, B. F., Freeman.
Eberly, Henry, Garden City.
Emrick, Lee, Harrisonville.
Evans, Miss Mary, Belton.
Hadden, P. I., Garden City.
Hilderbrand, Aubrey R., Peculiar.
King, M. V., Garden City.
Perry, Ross, Harrisonville.
Randol, J. M., Creighton.
Ramsey, R. D., Garden City.
Shouse, Harriett, Belton.
Stark, D. W., Westline.
Underwood, W. M., Route 2, Garden City.
Ward, W. G., Route 1, Drexel.
Ziegler, Martin, Garden City.

CEDAR.

Barker, G. W., Route 2, Stockton.
Flood, Jas., Pleasant View.
Koppenhafer, F. H., Star Route, Jerico Springs.
Lackey, J. H., Lock Box 127, Jerico Springs.
Lyon, J. C., Eldorado Springs.
O'Bryant, Byron, Route 3, Stockton.
Sharp, O., Eldorado Springs.
Stevens, Isaac N., Eldorado Springs.
Tucker, J. W., Route 3, Eldorado Springs.

CHARITON.

Daily, W. W., Brunswick.
Kubo, J. C. T., Keytesville.
Myers, C. R., Brunswick.
Myers, C. J., Route 1, Brunswick.
Nash, Virgil, Route 1, Triplett.
Steiman, Chas., Dalton.
Sturm, A., Brunswick.
Wallace, J. C., Keytesville.

CHRISTIAN.

Abney, Jas., Ozark.
Acuff, Z., Ozark.
Amsler, F. W., Billings.
Anderson, Geo., Oldfield.
Appleby, T. R., Billings.
Arndt, W. C., Billings.
Bard, J. E., Chadwick.
Bell, B. H., Billings.
Bell, Horace, Billings.
Bishop, E. M., Billings.
Boyd, W. R., Ozark.
Bray, C. V., Sr., Route 3, Billings.
Bray, Nicholas, Sr., Billings.
Cave, P. W., Ozark.
Clay, H. A., Ozark.
Combs, W., Billings.
Culbertson, Wm. C., Billings.
Davis, H. F., Ozark.
Day, H. H., Sparta.
Dreier, J. A., Billings.
Drury, Frank, Ozark.
Dutton, A. W., Oldfield.
Edelmann, A., Billings.
Ely, B. F., Billings.
French, J. M., Billings.
Garbee, H. A., Billings.
Gardner, Geo. H., Billings.
Gibbs, W. H., Montague.
Gibson, S. P., Sparta.
Giessman, John, Billings.
Goodwin, Jas., Billings.
Hale, G. C., Sparta.
Handy, I. H., Ozark.
Hannebaum, W., Billings.
Harper, Jas., Route 4, Ozark.
Harper, T. J., Ozark.
Hendricks, W. A., Billings.
Henry, Jno., Ozark.
Herring, J. H., Billings.
Hooter, John, Billings.
House, Jas., Billings.
Jamison, J. C., Bruner.
Jermgan, N. M., Route 4, Ozark.
Kastendieck, Andrew, Billings.
Kinlock, O. E., Billings.
Klappenberg, Chas., Billings.
Klass, A., Billings.
Koenig, Charles, Billings.
Lawing, S. S., Route 4, Ozark.
Lowe, Andy, Chadwick.
McCofferty, J. C., Route 2, Ozark.
McLean, J. M., Ozark.
Melton, Reuben, Ozark.
Meyers, Clinton L., Chadwick.
Monger, J. W., Sparta.
Moody, W. M., Oldfield.
Neal, D. R., Ozark.
Nelson, R. H., Sparta.
Newton, R. H., Sparta.
Newton, Saint, Oldfield.
Perrin, Rice, Ozark.
Phillips, J. A., Billings.
Purdy, C. E., Billings.
Rauch, Geo., Billings.
Roberts, M. F., Garrison.
Robertson, I. L., Ozark.
Sayler, John, Ozark.
Schaefer, W., Billings.
Schockley, Eli, Billings.
Schupback, C. C., Chadwick.
Smith, F. M., Route 4, Ozark.
Spiess, Henry, Ozark.
Spor, Geo., Billings.
Stone, Geo., Billings.
Stone, H. H., Billings.
Stutler, C. J., Oldfield.
Tiede, Ralph, Billings.
Trewatha, John, Billings.
Tunnell, J. L., Ozark.
Wallace, A. S., Billings.
Ward, W. A., Chadwick.
Washorn, J. W., Billings.
Watkinson, Wm., Billings.
Wiles, Wm., Route 3, Billings.
Williams, Preston, Billings.
Willis, C. A., Route 1, Sparta.

CLARK.

Ash, J. W., Kahoka.
Asher, A. T., Kahoka.
Conkle, Brose, Luray.
Conkle, Pete, Luray.
Courtney, M. A., Wayland.
Feldman, J. J., Kahoka.
Forrester, Chas., Kahoka.

Nelson, Andrew, Revere.
Puder, John H., Kahoka.
Sinclair, J. M., Route 4, Kahoka.
Smulling, J. D., Wyaconda.
Yowell, J. W., Revere.

CLAY.

Aul, Conrad, Smithville.
Bales, J. E., Excelsior Springs (504 Summit St.)
Barkley, J. J., Liberty.
Beatty, John W., Excelsior Springs.
Bryant, Lewis H., Liberty.
Carey, E. T., Kearney.
Carothers, W. J., Excelsior Springs.
Carpenter, Dan, Harlem.
Chandler, Asa, Randolph.
Conway, S. A., Liberty.
Davis, J. S., Liberty.
Donaldson, J. F., Route 4, Liberty.
Estes, C., Liberty.
Hansen, J. C., Harlem.
Haubaugh, R. L., Liberty.
Hay, C. E., Route 1, Harlem.
Howdeshall, Miss Amanda, Excelsior Springs.
Keller, Eugene, Harlem.
King, Chas. E., Liberty.
Laughlin, C. M., Liberty.
Norcross, C. D., Liberty.
Savage, O. R., Harlem.
Schroeder, F. H., Harlem.
Schroeder, Hugo, Harlem.
Schroeder, Rudolph, Harlem.
Vassmer, H. O., Excelsior Springs.
Walker, L., Route 5, Liberty.
White, J. A., Randolph.
Whitmire, Wm., Harlem.
Woods, Kemp W., Smithville.

CLINTON.

Alexander, A. R., Plattsburg.
Culver, W. L., Gower.
Everett, Albert L., Gower.
Groom, E. C., Gower.
Knoop, W. W., Cameron.
Mohler, E., Plattsburg.
Null, W. F., Cameron.
Poage, S. M., Route 5, Plattsburg.
Siener, Grant H., Cameron.

COLE.

Browning, J. H., Eugene.
Clarenbach, L. A., 201 E. Miller St., Jefferson City.
Dallmeyer, W. A., Jefferson City.
Davis, A. J., Jefferson City.
Distler, Geo., Route 1, Jefferson City.
Dix, C. A., Route 1, Jefferson City.
Dix, L. V., Route 1, Jefferson City.
Faust, John G., Route 1, Jefferson City.
Hall, L. J., Dept. of Education, Jefferson City.
Hentges, Henry, Jefferson City.
Hort, S. S., Route 1, Jefferson City.
Jones, W. R., Henley.
Klindt, Fred, Eugene.
Lowe, S. H., Route 1, Jefferson City.
Maddox, Wm., Jefferson City.
Pope, W. S., Jefferson City.
Purzner, Chas., Jefferson City.
Railton, Frank, Jefferson City.
Renn, Jake, Route 1, Jefferson City.
Reinke, Gus, 510 W. McCarty St., Jefferson City.
Sanderson, Peter J., Jefferson City.
Schmidt, H. T., Swift's Highway, Jefferson City.
Wagner, V. L., 223 E. Dunklin St., Jefferson City.
Wyatt, Geo. H., Jr., Route 1, Jefferson City.
Yost, Fred, Jefferson City.

COOPER.

Adams, W. D., Boonville.
Barnes, A. E., Boonville.
Bechtold, Frank, Boonville.
Bell, C. C., Boonville.
Biltz, H. C., Bunceton.
Boonville H. S., C. B. Gentry, Prin., Boonville.
Brewster, M. H., Boonville.
Carpenter, G. E., Bunceton.
Chambers, G. E., Boonville.
Chilton, E W., Boonville.
Cosgrove, John, Boonville.
Cowell, C. G., Boonville.
Dauwalter, Fred, Boonville.
Effinger, Henry, Boonville.
Geiger, Lawrence, Boonville.
Goodman, T. W., Boonville.
Green, J. A., Boonville.
Griffin, Bessie, Otterville.
Hadelich, Richard, Boonville.
Hain, Geo. J., Boonville.
Henshaw, Jas., Boonville.
Hockenbery, A. T., Bunceton.
Hunt, W. A., Boonville.
Jaeger, Paul, Boonville.
Jenkins, H. W., Boonville.
Johnston, Col. T. A., Boonville.
Kincaid, R. F., Blackwater.
Kreeger, Jas. L., Boonville.
Krohn, Jno., Boonville.
Lionberger, Frank, Boonville.
Logan, J. P., Boonville.
McFarland, T. W., Boonville.
Melkersman, Ed., Boonville.
Meyer, Wm., Boonville.
Miller, Chas. G., Boonville.
Mittelbach, Wm., Boonville.
Moore, R. L., Boonville.
Morton, G. P., Speed.
Morton, R. L., Boonville.
Muntzel, Martin W., Boonville.
Muntzel, Peter, Speed.
Neef, Carl, Boonville.
Neef, F. A., Boonville.
Neef, J. H., Boonville.
Nelson, A. J., Bunceton.
Nelson, Edgar C., Bunceton.
Nixon, D. F., Pilot Grove.
Orear, Prof. M. A., Boonville.
Pendleton, W. G., Boonville.
Peyton, T. R., Boonville.
Peyton & Barnes, Boonville.
Powers, John G., Blackwater.
Robein, Henry, Boonville.
Roberts, E. H., Boonville.
Rossen, S. C., Boonville.
Rudolph, Adam, Boonville.
Schack, Chris., Boonville.
Scheotzhauer, C., Speed.
Schmidt, Herman, Boonville.
Schmidt, Leonard, Boonville.
Scott, W. C., Boonville.
Sloan, Miss Dora, Boonville.
Sloan, M. R., Boonville.
Slocum, W. E. S., Boonville.
Smiley, Maj. W. A., Boonville.
Sombart, Mrs. Sophia F., Boonville.
Spahr, Mrs. Lina, Bunceton.
Stammerjohn, E. C., Boonville.
Stephens, W. H. H., Bunceton.
Stephens, W. J. H., Bunceton.
Stretz, J. Henry, Boonville.
Tally, Wm., Boonville.
Thoma, E. G., Boonville.
Thornton, S. Y., Blackwater.
Toennes, Rudolph, Boonville.
Trimmer, Chas. F., Boonville.
Tuttle, Albert, Boonville.
Van Ravenswaay, Dr. C. H., Boonville.
Windsor, H. G., Boonville.
Wooldridge, Mrs. D. T., Boonville .
Zollinger, J. H., Boonville.

CRAWFORD.

Barron, J. W., Route 1, Cuba.
Carter, Guy F., Wesco.

Choisser, T. W., Bourbon.
Coffee, Dr. T. J., Steelville.
Cunningham, R. W., Cuba.
Fitzpatrick, J. S., Steelville.
Garrison, J. D., Leasburg.
Hackman, J. F., Bourbon.
Halbert, Preston, Steelville.
Halbert, W. P., Steelville.
Hassler, W. H., Steelville.
Hopkins, Levi, Steelville.
Ingalls, J. H., Cuba.
Krehbiel, Daniel, Steelville.
Lay, Chas., Steelville.
Lorenze, G. F., Leasburg.
Marsh, Jas. F. Steelville.
Minces, J. H., Steelville.
Moordale, B. C., Cuba.
Morrison, D. E., Wesco.
Norvell, R. F., Steelville.
Norvell, C. D., Steelville.
Recklein, Wm., Cuba.
Ringeling, Francis, Bourbon.
Smith, F. J., Steelville.

DADE.

Bell, John, Everton.
Clayton, J. R., Route 4, Lockwood.
Dralesbough, S. J., Lockwood.
Dyson, W. A., Route 4, Everton.
Gibson, L. L., Route 2, Everton.
Greene, D. G., Route 4, Everton.
Griffin, R. A., Bona.
Hawkins, G. W., Everton.
Hughes, W. T., Everton.
Jerome, L. P., Everton.
Jones, Mrs. May, Everton.
Kaelke, W. H., Lockwood.
Lammers, Ben H., Lockwood.
Lawrence, L. R., Everton.
Lower, S. J., Everton.
McMasters, J. R., Bona.
Meishof, A., Route 5, Everton.
Neale, B. M., Greenfield.
Niehoff, Wm., Jr., Lockwood.
Pidcock, P. R., Lockwood.
Reeve, Miss Clara M., Greenfield.
Schrinckle, H. H., Route 4, Everton.
Schuerman, H., Lockwood.
Scroggs, Edwin T., Greenfield, Route 3.
Starnate, M. T., Route 4, Everton.
Van Pelt, W. A., Everton.
Walker, J. W., Route 1, Everton.
Wilson, Geo. W., Everton.
Wilson, W. S., Everton.
Wright, J. T., Route 4, Everton.

DALLAS.

Joyner, W. G., Route 2, Buffalo.
McDowell, J. C., Buffalo.

DAVIESS.

Brodbeek, S. S., Gallatin.
Howard, W. E., Route 4, Gallatin.
McDonald, Chas., Gallatin.
Venable, Sam, Gallatin.

DeKALB.

Butler, Thos., Route 2, Amity.
Carpenter, W. M., Maysville.
Eggleston, Hiram, Route 6, Maysville.
Reynolds, J. J., Maysville.
Sager, Thos. H., Maysville.
Sims, M. W., Union Star.

DENT.

Cope, J. J., Salem.
Hamilton, S. A., Ranger.
Higgins, E. C., Salem.
Kimmel, Carl, Lecoma.
McClelland, W. B., Lenox.
Welsh, W. H., Salem.
Young, W. W., Salem.

DOUGLAS.

Anderson, M. L., Bryant.
Coble, E. R., Ava.
Davis, O. B., Ava.
Douglas County Normal Library, Ava.
Hamden, J. D., Ava.
Hinkon, W., Ava.
Hoffman, Emory, Ava.
Hylton, J. A., Ava.
Laurie, H. A., Dickey.
Martin, J. H., Ava.
Matthis, E. C., Prior.
Pettit, L. H., Ava.
Preston, Mrs. J. N., Ava.
Storms, W. V., Rome.
Turner, J. E., Ava.

DUNKLIN.

Allen, Eath, Campbell.
Allen, Ed., Campbell.
Birthwright, Chas., Clarkton.
Blakney, Walter, Campbell.
Butler, A., Clarkton.
Carmen, C. C., Route 1, Clarkton.
Chatham, Dr. A. T., Clarkton.
Connley, Geo., Campbell.
Conrad, Luther, Campbell.
Crawford, John, Campbell.
Crumley, W. P., Campbell.
Derryberg, U. H., Campbell.
Drenscomb, D. E., Route 1, Malden.
Dunscomb, W. T., Clarkton.
Faughn, Geo., Campbell.
Fischer, J. W., Clarkton.
Garrison, Robt., Campbell.
Geer, Harvey, Campbell.
Godsey, G. B., Route 1, Malden.
Goodnight, R. L., Route 1, Clarkton.
Gordan, J. W., McGuire.
Gordan, W. W., McGuire.
Graham, A. L., Route 1, Clarkton.
Grimes, Lon, Campbell.
Gum, James, Clarkton.
Gum, John, Clarkton.
Harris, J. M., Route 1, Malden.
Harrison, F. E., Route 1, Clarkton.
Henderson, Kinse, Campbell.
Hicks, G. R., Campbell.
Housier, J. W., Malden.
James, C. E., Clarkton.
James, Wm., Campbell.
Jones, J. F., McGuire.
Keller, D. J., Malden.
Kimble, Albert, Campbell.
Kimmel, G. A., Route 1, Malden.
Kitchen, J. T., McGuire.
Lunius, J. W., McGuire.
Lynn, J. W., Campbell.
McDonald, Mrs. C. P., Senath.
Meek, W. H., Route 1, Clarkton.
Mayfield, E. H., Campbell.
Miller, P. J., Clarkton.
Miller, Andy, McGuire.
Miller, F. W., Campbell.
Miller, J. M., Campbell.
Moore, Geo., Clarkton.
Moore, G. W., Clarkton.
Napper, W. H., Campbell.
Page, Ed., Clarkton.
Parent, Robt., Campbell.
Parks, E., McGuire.
Parnell, R. N., McGuire.
Penny, Z. B., Clarkton.
Poe, E. W., Senath.
Pollock, L. D. C., Campbell.
Ponder, T. G., Campbell.
Price, J. C., McGuire.
Price, R. F., McGuire.
Reeves, J. M., Route 1, Clarkton.
Roth, W. I., Clarkton.
Shores, J. M., McGuire.
Slankard, W. J., Campbell.
Taylor, E. O., Campbell.
Templeton, W. D., McGuire.

Tesreau, Albert, Campbell.
Thomas, J. M., Campbell.
Young, R. C., Campbell.

FRANKLIN.

Bagby, R. J., & Sons, New Haven.
Belew, S. D., St. Clair.
Berthold, Albert, Grays Summit.
Bryant, W. B., Spring Bluff.
Clemm, Edw., Washington.
Crowe, Hon. J. T., Beaufort.
Dammer, H. G., Krakow.
Echkoff, Fred T., Labaddie.
Fischer, J. R., Route 1, Robertsville.
Herrmann, Ed., Route 2, Sullivan.
Howe, John, Pacific.
Kamper, H. H., Gerald.
Klemm, Ed., Washington.
Miller, Henry, Route 1, Catawissa.
Miller, Miner A., Route 1, Catawissa.
Mulroy, Stephen A., Route 2, Sullivan.
Murrell, Wm., Lonedell.
Myersick, Wm., Union.
Pickering, M. M., St. Clair.
Remmert, O. H., Leslie.
Richie, J. M., Route 2, Union.
Rollfing, Arnold, Berger.
Reese, Aug., Sullivan.
Schillan, Chas. T., Union.
Schmertman, Hy., Krakow.
Steines, E. E., Route 1, Pacific.
Treffinger, Anton, Route 1, Box 80, Pacific.
Vieman, Hon. Fred., Pacific.
Wall, Oches, Morrellton.
Winkler, C. H., Pacific.

GASCONADE.

Birkel, W. S., Route 3, Hermann.
Brandleorst, Wm., Bem.
Buente, F. L., Morrison.
Farnstedt, C. F., Stony Hill.
Gruner, H. E., Bem.
Hibler, W. T., Route 3, Owensville.
Kemper, Ed., Hermann.
Koenigmark, J. W., Owensville.
Maupin, F. L., Route 1, Rose Bud.
Mundwiller, Walter A., Hermann.
Taylor, Chas., Route 4, Owensville.

GENTRY.

Adams, G. E., Darlington.
Comstock, C. C., Albany.
Drysdale, Oscar P., Route 5, King City.
Gault, W. M., Route 6, King City.
Kemp, G. S., King City.
Kiser, W. E., Route 5, Box 6, Stanberry.
Leonard, Miss Sarah D., King City.
Stevenson, Adolph, King City.

GREENE.

Beal, Dr. E. L., Republic.
Best, R. R., Republic.
Boswell, Dr. Jesse V., Route 9, Springfield.
Britian, E. A., Republic.
Carr, T. J., Republic.
Carr, J. L., Republic.
Coffman, J. D., Strafford.
Combs, C., Walnut Grove.
Criswell, W. C., Republic.
Darby, Geo. W., Route 3, Springfield.
Darby, M. E., Garlick Bldg., Springfield.
Davis, G. W., Republic.
Dickenson, V. W., Republic.
Dimple, E. P., Republic.
Evans, Frank B., Willard.
Evans, Wm., Route 4, Ash Grove.
Field, J. P., Springfield.
Fink, R. M., Springfield.
Fretz, H. H., Springfield.
Fuhr, Ed., Republic.
Gregory, G. H., Republic.
Haldeman, J. R., Springfield.
Haseltine, L. K., Springfield.
Haseltine, S. A., Springfield.
Haseltine, S. I., Route 4, Springfield.
Hopkins, G. W., Springfield.
Howard, A. M., Route 1, Brookline.
Howard, H. T., Republic.
Howard, M. L., Republic.
Howell, A. W., Springfield.
Hubble, M. J., Springfield.
Holbrock, R. B., Route 9, Springfield.
Holland, Chas., Springfield.
Hughes, Ed., Springfield.
Irvin, W. A., 1360 Benton Ave., Springfield.
Johns, R., Republic.
Jones, Dr. T. H., 1412 Euclid Ave., Springfield.
Kelly, J. M., Springfield.
Kelley, Leroy, Route 1, Ash Grove.
King, A. D., Republic.
King, T. H., Springfield.
King, W. T., Republic.
Kizer, Dr. D. T., Normal School, Springfield.
Leibheart, John, Turners.
Lewis, Fred, Battlefield.
Lybarger, J. H., Ash Grove.
Lybarger, W. N., Route 2, Ash Grove.
McAfee, Judge C. B., Springfield.
Miller, G. W., 999 Benton Ave., Springfield.
Ollis, C. P., Springfield.
Owens, Dug, River Park.
Park, H. H., Springfield.
Porter, R. H., Springfield.
Price, J. A., Republic.
Reynolds, M. L., Nichols.
Roberts, J. R., Springfield.
Rore, A. E., Republic.
Scharff, M., Route 3, Strafford.
Smith, Mrs. M. C., Springfield.
Smith, Robert, Route 3, Springfield.
Thieme, H., Springfield.
Thompson, J. B., 2114 Missouri Ave., Springfield.
Tippin, G. T., Nichols.
Tuttle, W. W., 713 E. Elm St., Springfield.
Wade, D. A., Republic.
Wakefield, T. A., 826 E. Walnut St., Springfield.
Wilhoit, Roy, Route 7, Springfield.
Yarbrough, J. M., Springfield.

GRUNDY.

Brainard, Elizabeth, Trenton.
Chenoweth, Ira L., Route 4, Trenton.
Dean, Marion, Spickard.
Eveland, R. H., Dunlap.
Hazen, F. A., R. F. D., Spickard, Half Rock.
Keith, John Bass, Spickard.
Kennedy, M. G., Trenton.
Layson, W. F., Route 6, Trenton.
McGrath, Geo. C., Trenton.
Rhodes, Melvin, Route 3, Spickard.
Rogers, Herbert G., 308 Linn St., Trenton.
Stewart, V. E., Spickard.
Talle, J. C., Trenton.
Walker, Dale, Route 2, Trenton.
Wilson, J. B., Spickard.

HARRISON.

Duncan, Earle C., New Hampton.
Goodwin, N., Route 2, Martinsville.
Maize, H. T., Route 5, Bethany.
Skinner, W. H., Bethany.

HENRY.

Armstrong, Rev. W. P., Clinton.
Avery, J. A., Calhoun.
Banham, M. L., Clinton.
Baum, Jos., Montrose.
Baumgarten, Henry, Clinton.
Bonham, M. L., Clinton.
Bradley, N. T., Route 22, Blairstown.
Busse, Henry, Urich.
Butler, J. N., Route 39, Brownington.
Coe, David, Clinton.
Crissman, D. S., Route 35, Montrose.
Day, May, Lewis Station.
Dension, C. C., Clinton.

Doyle, Mrs. Mary, Clinton.
Ervine, David, Urich.
Friend, J. P., Deepwater.
Fry, Mrs. C. W., Route 9, Clinton.
Griffith, Geo. W., Route 1, Clinton.
Hart, Edgar, Urich.
Hart, W. A., Sweet Briar Farm, Clinton.
Henry, Mrs. Mary, Clinton.
Hoppe, Edward, 214 Jefferson St., Clinton.
Johnson, Chas., Route 8, Clinton.
Lord, A. D., Deepwater.
Macafoose, W. B., Windsor .
McGinness, A. W., Clinton.
Marsh, L. A., Windsor.
Newberry, John B., Route 31, Montrose.
Rusk, E. W., Windsor.
Seigfreid, W. J., 502 N. Third St., Clinton.
Stephens, G. A., LaDue.
Stevenson, J. A., Route 36, Deepwater.
Switzer, Miss M., 310 South Third St., Clinton.
Taylor, Owen F., Route 8A, Clinton.
Thompson, J. E., Windsor.
Thrush, Lee, Alberta.
Tillman, Wm. H., Route —, Clinton.
Wallace, J. L., Route 2, Clinton.
Ward, W. S., Route 22, Blairstown.
Wesner, J. A., Windsor.

HICKORY.

McFarlen, Chas., Jordan.
Ray, F. M., Jordan.

HOLT.

Bucher, S. N., Oregon.
Davis & Mitchell, Mound City.
Huiatt, Sam, Forest City.
Huiatt, S. T., Forest City.
Landers, P. A., Forest City.
Meyer, S. A., Oregon.
Milne, J. R., Forbes.
Murray, Geo. R., Oregon.
Murray, J. H., Oregon.
Murray, Wm., Mound City.
Porter, Jesse C., Mound City.
Roberts, Rev. T. D., New Point.
Sims, W. E., Oregon.
Smith, Fred E., Bigelow.
Tracey, Dr. J. C., Mound City.
Weaver, Willis, Forbes.
Vandeventer, Early, Mound City.

HOWARD.

Ancell, Leonard, Route 1, Fayette.
Blankenbaker, Guy, New Franklin.
Blankenbaker, H. F., New Franklin.
Chancellor, J. F., Franklin.
Collins, Dr. M. B., Glasgow.
Crowley, Benton, Glasgow.
Godfrey, H. F., Fayette.
Harris, Ed., Franklin.
Kingsberry, Horace, New Franklin.
Kingsberry, R. T., New Franklin.
Kinney, Miss Alice, Route 2, New Franklin.
O'Brien, E. H., Route 1, Fayette.
Ravenel, S. W., New Franklin.
Schnell, Henry, Glasgow.
Slagle, M. W., Fayette.
Tindall, Lowrey, Fayette.
Todd, T. H., New Franklin.

HOWELL.

Averell, A. D., Willow Springs.
Buck, Dan W., Box 242, West Plains.
Capps, J. B., Route 1, Hutton Valley.
Carey, R., Willow Springs.
Caudle, C. W., Willow Springs.
Cook, John, Willow Springs.
Divers, Wm., Amy.
Dowell, John, Hutton Valley.
Farmer, John, Route 1, Pomona.
Foster, Samuel D., West Plains.
Funke, Fred L., Mountain View.
Ganschow, H., Willow Springs.
Gassaway, Ralph, Pomona.
Gassaway, W. H., Pomona.
Goyer, Geo., Route 1, Pomona.
Harlow, Dr. Irvine L., Route 1, Mountain View.
Harper, C. P., West Plains.
Hasky, Jno., Willow Springs.
Hiatt, Jas., Willow Springs.
Higgins, H. W. B., Willow Springs.
Hollenbeck, A. T., West Plains.
Johnson, G. H., Willow Springs.
Kirkpatrick, S., Pomona.
Kunkle, Daniel, Trask.
Lucas, Rich., Mountain View.
Lauver, F. W., Olden.
McAdams, J. C., Route 1, Willow Springs.
McCulloch, John, Route 1, Mountain View.
McMahon, Thos., Pomona.
Milstead, Albert, Pomona.
Mitchell, L. L., Willow Springs.
Modrall, Chas., Route 1, Pomona.
Merritt, E. H., Pomona.
Moore, Dave, Willow Springs.
Osborn, H., Pomona.
Palmer, R. O., Pomona.
Parsons, W. B., Pomona.
Pearson, J. G., Pomona.
Peary, T. J., West Plains.
Peterson, John R., Willow Springs.
Pope, J. D., Willow Springs.
Range, J. W., Willow Springs.
Rich, A. J., Clinton.
Richards, F. N., Pomona.
Richards, W. E., Route 1, Pomona.
Sessen, G. L., West Plains.
Slaughter, Peter, Pomona.
Sloan, R. B., Box 6, Burnham.
Snyder, H. T., Pomona.
Sphere, W. F., Pomona.
Strickland, F. A., Pomona.
Summers, W. L., Chapin.
Tando, L. E., West Plains.
Thomas, J. B., Willow Springs.
Vandersloot, F. E., Willow Springs.
Weaver, J. C., Willow Springs.
Weaver, M., Willow Springs.
Wilson, S. C., Pomona.
Wood, B. F., Pomona.
Wood, Geo., Pomona.
Yonkers, E. K., Willow Springs.
Yonkers, C. H., Willow Springs.

IRON.

Hale, A., Belleview.
Lashley, A., Belleview.
Long, J. H., Belleview.
McKinney, R., Belleview.
Pollock, Geo. J., Arcadia.
Stark, Geo., Arcadia.

JACKSON.

Adams, T. L., 417 Walnut St., Kansas City.
Allen, Sidney P., Kansas City.
Bacon, Langston, 600 New England Bldg., Kansas City.
Becker, J. W. G., 422 Argyle Bldg., Kansas City.
Benedict, H. G., 1578 E. 33rd St., Kansas City.
Branham, M. L., 930 S. Main St., Independence.
Bryant, John B., 2122 Walrud Ave., Kansas City.
Bush, B. T., Courtney.
Butterfield, E. C., Lee's Summit.
Butterfield, J. S., Lee's Summit.
Byrum, L. W., 610 K. C. Life Bldg., Kansas City.
Cady, V. M., 227 Bayard Ave., Kansas City.
Chandler, C. A., Swope Park, Kansas City.
Combs, G. H., 3026 E. Sixth St., Kansas City.
Croysdale, Josephine B., 4010 Warwick Blvd., Kansas City.
Danks, E. J., 1310 Central St., Kansas City.

Dodds, Homer, 325 E. Walnut, Independence.
Engel, Geo. F., 3714 Euclid Ave., Kansas City.
Funk, Dr. J. W., Shukert Bldg., Kansas City.
Farmer, F. A., 554 Gibraltar Bldg., Kansas City.
Fisher, C. H., Route 33, Greenwood.
Ford, J. C., 418 W. 10th St., Kansas City.
Gable, F. B., 1400 St. Louis Ave., Kansas City.
Goodman, L. A., 4000 Warwick Blvd., Kansas City.
Grant, Horace, 507 Ridge Bldg., Kansas City.
Graves, E. H., Lee's Summit.
Gregg, S. D., Independence.
Grissom, Herbert, care The Star, Kansas City.
Hare, Sid J., 3224 Campbell St., Kansas City.
Hilker, Harry, Washburn.
Hill, Adam, Rural Route, Independence.
Hill, J. L., Rural Route, Independence.
Hoffman, Ralph, 61st & Wornall Rd., Kansas City.
Holcomb, N. R., Oak Grove.
Hudspath, T. B., Route 86, Sibley.
Jewell, Mrs. H., 211 E. 11th St., Kansas City.
Johnson, G. C., 1204 W. 9th St., Kansas City.
Johnston, Geo. H., 233 Rialto Bldg., Kansas City.
Kansas City Packer, The, 23 E. Missouri Ave., Kansas City.
Klingman, Pauline, Grain Valley.
Lippincott, A., 2924 Michigan St., Kansas City.
Long, L. F., 2516 Agnes Ave., Kansas City.
Major, A., 3121 Chestnut St., Kansas City.
Marston, Chas., M., care The Packer, 23 E. Mo. Ave., Kansas City.
Martin, J. A., 2447 Askew Ave., Kansas City.
McCune Home, Independence.
McKown, Frank T., 4125 Tracy Ave., Kansas City.
McNamara, J. J., 220 Temple Bldg., Kansas City.
Mershon, T. W., Buckner.
Miller, Henry R., 818 Grand Ave., Kansas City.
Missouri & Kansas Farmer, Kansas City.
Missouri Ruralist, The, 1015 Central St., Kansas City.
Mosher, Miss E. S., Bryant Bldg., Kansas City.
Nordenholz, Wm., 3209 Bell St., Kansas City.
Norton, H. B., Mt. Washington, Kansas City.
Oskamp, Jos., 3434 Wyandotte St., Kansas City.
Peffer, T. A., Independence.
Potter, J., 3226 Montgall Ave., Kansas City.
Pray, W. C., 1817 E. 9th St., Kansas City.
Smith, E. E., 3820 Wyandotte St., Kansas City.
Snodgrass, J. T., 3935 Wyandotte St., Kansas City.
Spencer, Nat., Mo. & Kansas Farmer, Kansas City.
Stewart, D., Independence.
Tipple, Geo. E., Lee's Summit.
Utter, Miss Adeline, 3941 St. John Ave., Kansas City.
Van Vranken, P. A., Grain Valley.
West, Thos. H., 2324 Tracy Ave., Kansas City.
Whitten, F. M., Hickman Mills.
Whinston, C. H., 437 New York Life Bldg., Kansas City.

JASPER.

Abernathy, R. T., Webb City.
Adams, Z., Sarcoxie.
Adams, Ira, Sarcoxie.
Almagourd, M. J., Sarcoxie.
Arnold, James, Route 3, Reeds.
Arthur, J., Route 1, Reeds.
Auten, B. C., 1175 Grand Ave., Carthage.
Baker-Jones Furniture Co., Carthage.
Barnes, W. C., Carthage.
Beck, A. F., Sarcoxie.
Bessie, Furrow, Route 8, Carthage.
Blair, Chas. A., 1157 S. Main St., Carthage.
Boswell, A. V., Carthage.
Brewster, Geo., Sarcoxie.
Brite, A. G., Sarcoxie.
Broadway, Thos., Sarcoxie.
Brooks, Chester, Avilla.
Brooks, Lee, LaRussell.
Brown, Bruce, Reeds.
Burkholder, W. T., Sarcoxie.
Burks, J. T., LaRussell.
Cale, C. W., Sarcoxie.
Carmichael, Arch, Sarcoxie.
Chapman, Dan, Avilla.
Clark, Dr. L. W. Carterville.
Claycomb, S. H., Joplin.
Corum, Geo., Sarcoxie.
Cramer, Dan, Sarcoxie.
Cramer, J. E., Sarcoxie.
Dawson, C. H., Sarcoxie.
Davis, Jeff., Carthage.
Davidson, J. M., Sarcoxie.
Daugherty, Bert A., Route 7, Carthage.
Dennison, Wm., Sarcoxie.
Dobbs, J. H., Sarcoxie.
Downer, Ed., Sarcoxie.
Driver, C. V., Route 2, Reeds.
Driver, T. J., Route 1, Reeds.
Driver, Wm. J., 1000 Chestnut St., Carthage.
Durham, L. S., 1302 Main St., Carthage.
Edwards, Wm., Sarcoxie.
Eoff, A. U., LaRussell.
Ervin, Wm., Sarcoxie.
Ferguson, Mrs. M. E., Route 2, Jasper.
Forsythe, J. N., LaRussell.
Foster, Jas. H., Sarcoxie.
Garver, Joe, Sarcoxie.
Gilbreath, Jerry, Avilla.
Gleason, Geo., Jasper.
Graff, A. W., LaRussell.
Graff, Jacob, LaRussell.
Grieb, A. A., Route 3, Carthage.
Grim, John, Smithfield.
Groff, John, Carthage.
Gustafson, F. O., Sarcoxie.
Haggard, Chas., Sarcoxie.
Hall, Fred, Avilla.
Hall, Geo., Avilla.
Haughawart, F. C., Oronogo.
Henry, R. W., Sarcoxie.
Higginbotham, R. A., Joplin.
Hirsch, Wesley, Sarcoxie.
Holmes, B. B., Route 3, Reeds.
Hood, N. B., Reeds.
Houck, L. E., Sarcoxie.
Hough, G., Route 1, Reeds.
Hurlbut, W. K., Joplin.
Hurt, Chas., Sarcoxie.
Jean, S. J., Route 3, Joplin.
Jennings, James, Sarcoxie.
Johnson, M. S., Route 3, Carthage.
Johnson, E. W., Sarcoxie.
Jordan, A. J., Carthage.
Ladd, C. S., Oronogo.
Lichliter, N. B., 124 N. Pearl, Joplin.
Lofton, W. O., Waco.
Logan, B. C., Sarcoxie.
Lomine, E. C., Carthage.
Long, J. A., Sarcoxie.
Mann, A. L., Carthage.
Marshall, W. H., Joplin.
McAshland, C. B., Reeds.
McDaniel, Chas., Route 1, Reeds.
McGowan, Wm., Sarcoxie.
McNallie, C., Sarcoxie.
McNallie, F. F., Sarcoxie.
McNallie, D., Plant & Fruit Co., Sarcoxie.
Meador, Jasper, LaRussell.

Miller, H. G., Route 3, Carthage.
Motley, M. C., Sarcoxie.
Nickell, I. F., 1472 Grand Ave., Carthage.
Oliver, M. E., Sarcoxie.
Osborn, S. M., Sarcoxie.
Osborn, Jno., Sarcoxie.
Palmer, Clarence, Sarcoxie.
Palmer, M. J., Sarcoxie.
Parker, J. A., Sarcoxie.
Pierce, Andy, LaRussell.
Pickett, John, Carthage.
Pike, E. S., Route 7, Carthage.
Pope, Henry W., Sarcoxie.
Robinson, J. S., Sarcoxie.
Roper, Jim, Sarcoxie.
Roux, Frank, LaRussell.
Rush, Elmer, Route 2, Reeds.
Russell, Z. T., Carthage.
Selby, Frank, Sarcoxie.
Sewell, W. S., Carthage.
Shelton, A. J., Carthage.
Shuler, W. S., Carthage.
Stemmons, Bunk, Route 2, Reeds.
Stemmons, James, Carthage.
Surface, Geo. W., Oronogo.
Tate, J. B., Route 1, Sarcoxie.
Turk, W. A., Route 3, Carthage.
Turk, E. E., Route 3, Carthage.
Ummel, Ben., Route 1, Reeds.
Wagner, J. B., Sarcoxie.
Walker, J. S., Webb City.
Watkins, Jos. C., Joplin.
Weng, Jos., Route 2, Reeds.
Whaley, I. W., LaRussell.
White, L. F., Route 3, Carthage.
Whitehead, Jas., Sarcoxie.
Wild, A. O., Sarcoxie.
Wild, C. M., Sarcoxie.
Wild, Frank H., Sarcoxie.
Wild, G. M., Sarcoxie.
Wild, H. N., Sarcoxie.
Wild, J. B., & Bros., Sarcoxie.
Willoughby, W. G., Sarcoxie.
Willoughby, W. L., Sarcoxie.
Wilson, Chas., Sarcoxie.
Wilson, Jack, Sarcoxie.
Wilson, John, Sarcoxie.
Wilson, W. T., Route 2, Reeds.
Wisegarver, Chas., 610 Orner St., Carthage.
Woods, Wm. H., Sarcoxie.
Wright, Joe, Sarcoxie.
Wyatt, Jas., Route 1, Sarcoxie.
Youngblood, John, Route 2, Reeds.

JEFFERSON.

Autry, J. W., DeSoto.
Berry, Wm., DeSoto.
Blackwell, L. F., Melzo.
Booth, Chas. S., Hillsboro.
Boyce, W. G., Plattin.
Brady, L. A., Box 264, DeSoto.
Carroll, D. W., Hematite.
Evens, Ed., Festus.
Franklin, W. T., Valles Mines.
Geiger, L. M., Hillsboro.
Grab, Thos., Hematite.
Griffin, D. C., Pevely.
Hoage, Otto, Route 3, Kimmswick.
Hoffman, E., Vineland.
Hughes, Rulla, Kimmswick.
Hurtgen, Mrs. Stella, Hillsboro.
Kaufman, Louis, Route 1, Hillsboro.
Koehler, Fred W., Kimmswick.
Long, W. T., Box 3, DeSoto.
Morgan, Robt. D., Route 1, Hillsboro.
Nahlik, J. B., Route 1, House Spring.
Smiley, G. P., DeSoto.
Saxton, Mrs. Lizzie, Sulphur Springs.
Ware, Jas. L., Route 2, DeSoto.

JOHNSON.

Adams, Frank, Warrensburg.
Adcock, J. A. B., Warrensburg.
Bailey, J. W., Route 1, Warrensburg.
Cairns, W. P., Knobnoster.
Christopher, J. C., Warrensburg.
Cockefair, W. R., Warrensburg.
Cowan, J. P., Warrensburg.
Dutcher, Prof. C. H., Warrensburg.
Fickas, John, Route 5, Warrensburg.
Funk, Theo., Warrensburg.
Gilkerson, A. H., Warrensburg.
Grosser, Robt., Route 35, Centerview.
Hoover, Prof. S. A., Warrensburg.
Kavanaugh, Milton, Warrensburg.
Mohler, Jesse, Warrensburg.
Ogden, C. H., Warrensburg.
Ozias, Chas. O., Warrensburg.
Ridley, Vincent W., Chilhowee.
Seawell, Prof. B. L., Warrensburg.
Smithson, A. F., Warrensburg.
Stigall, B. M., Warrensburg.
Stovall, Mrs. Geo., Route 42, Columbus.
Tompkins, W. A., Warrensburg.
Todd, Jonathan, Centerview.

KNOX.

Dailing, G. F., Baring.
Lutz, J. L., Hurdland.
Magruder, J. L., Hurdland.
Smith, L., Plevna.
Smith, Walter, Route 3, Knox City.
Stranahan, W. A., Hurdland.

LACLEDE.

Bland, John, Lebanon.
Bland, Mrs. R. P., Lebanon.
Clough, M. M., Conway.
Daugherty, John, Lebanon.
Davis, Jos., Conway.
Diffenderfer Bros., Lebanon.
Donnelly, Phil, Lebanon.
Draper, C. C., Lebanon.
Duval, W., Lebanon.
Farris, J. W., Lebanon.
Glynn, Will T., Lebanon.
Harris, A., Conway.
Harwood, Ernest E., Conway.
Hendrix, Jno., Conway.
Kelleman, C. B., Lebanon.
Latimer, Sam, Conway.
Lawyer, P., Lebanon.
Malcome, Joe, Conway.
Mansfield, Jas., Lebanon.
McKesson, J. E., Lebanon.
Mentz, J., Lebanon.
Nelson, A. T., Lebanon.
Newport, N. C., Conway.
Nixon, J. P., Lebanon.
Roe, Oliver, Lebanon.
Root, Jesse, Lebanon.
Russell, Chas., Lebanon.
Patterson, Jas. W., Conway.
Shook, Jos., Conway.
Smith, Harry, Lebanon.
Stokes, John W., Phillipsburg.
Stratton, Bert, Lebanon.
Turner, John V., Phillipsburg.
Wallace, W. J., Lebanon.
White, A., Nebo.
Whittaker, W. F., Conway.
Williams, L. B., Conway.

LAFAYETTE.

Arensmeier, F. W., Route 2, Wellington.
Bearchers, Henry, Alma.
Benning, T. B., Mayview.
Brand, E. C., Mayview.
Brandt, Earnest, Mayview.
Buck, E. O., Waverly.
Butts, E. S., Mayview.
Cauthorn Orchard Co., Jno. W., Waverly.
Cox, J. G., Odessa.
Field, Maurice, Higginsville.
Fitzpatrick, Prof. C., Higginsville.
Fresking, Emil G., Route 3, Concordia.
Gladish, Miss Cora, Higginsville.
Gladish, E. S., Higginsville.
Gladish, J. E., Route 3, Higginsville.
Gladish, J. W., Higginsville.
Gruber, Wm., Lexington.
Hampton, B. F., Odessa.

Harms, Wm., Route 2, Alma.
Heerwald, F., Concordia.
Herold, R. A., Route 1, Bates City.
Hohenwald Bros., Corder.
Keith, Wm. P., Mayview.
Kitlerer, G. F., Concordia.
Larkin, T. S., Route 1, Corder.
Maddox, W. T., Waverly.
Mathews, A. B., Mayview.
McChesney, Prof. Fred, Odessa.
Nalte, Wm., Mayview.
Rabius, G. H., Mayview.
Rabius, Henry, Mayview.
Phillip, H. T., Higginsville.
Phillips, J. H., Higginsville.
Rodekohr, Ed., Corder.
Roehrs, Henry, Alma.
Schmitz, S. R., Mayview.
Sharp, Carter, Higginsville.
Slusher, T. D., Route 1, Bates City.
Smith, G. W., Mayview.
Smith, Hugh, Mayview.
Smith, I. F., Mayview.
Smith, J. R., Mayview.
Teubner, Chas., Lexington.
Thieman, Louis W., Aullville.
Upshaur, Milton, Concordia.
Vickers, Jas., Mayview.
Williamson, F. D., Mayview.

LAWRENCE.

Alcock, J. F., Verona.
Armstrong, Ed., Verona.
Baker, W., Stotts City.
Baumgartner, Simon, Pierce City.
Bowman, John, Route 2, Pierce City.
Bradford & Co., Marionville.
Brigance, J. E., Route 3, Pierce City.
Brown, Albert, Route 5, Mt. Vernon.
Brown, W. J., Route 5, Mt. Vernon.
Butler, B. F., Marionville.
Calvin, F. P., Bower Mills.
Campbell, T. F., Route 2, Bower Mills.
Cannady, S. D., Marionville.
Carver, A. Z., Logan.
Clayton, D. W., Mt. Vernon.
Cobb, H. L., Aurora.
Coleman, M. L., Aurora.
Colley, Jas., Route —, Mt. Vernon.
Colley, Scott, Bower Mills.
Compton, T. F., Marionville.
Copeland, N. E., Verona.
Cowles, E. C., Marionville.
Cowles, I. I., Marionville.
Cravens, Dr., Marionville.
Cushing, W. W., Marionville.
DeBrosse, M. A., Verona.
DeLever, H. S., Marionville.
Deshner, Jacob, Route 1, Hoberg.
Doyes, Judge Jas., Pierce City.
Doyle, M. S., Pierce City.
Eaton, Z. T., Marionville.
Edwards, R. H., Pierce City,.
Flournoy, W. T., Marionville.
Forrester, L. N., Marionville.
Fowler, Raymond, Route 2, Mt. Vernon.
Gardner, M. B., Aurora.
George, R. F., Pierce City.
Gibbs, Norman, Mt. Vernon.
Grubaugh, J. E., Marionville.
Hall, A. T., Box 193, Marionville.
Hall, I. C., Mt. Vernon.
Hammers, Everett, Rural Route, Mt. Vernon.
Harlan, O. O., Marionville.
Hendricks, R. C., Route 1, Hallstown.
Henson, S., Mt. Vernon.
Hickman, W. E., Rural Route, Mt. Vernon.
Hillhouse, L. G., Route 3, Aurora.
Hill, Stephen, Route 1, Bower Mills.
Hopkins, T. R., Route 1, Pierce City.
Howard, J. T., Route 3, Marionville.
Hudson, John, Marionville.
Hudson, S. L., Marionville.
Jennings, C. H., Mt. Vernon.
Jennings, Wm., Stotts City.
Johnson, Finis E., Pierce City.
Jones, W. D., Marionville.
Jones, W. R., Henley.
Kelley, J. G., Pierce City.
Kirby, W. P. L., Mt. Vernon.
Kramme, H. W., Rural Route, Mt. Vernon.
Lawson, K., Route 1, Marionville.
Lester, John L., Rural Route, Mt. Vernon.
Lewis, W. T., Stotts City.
Lever, H. S., Marionville.
Logan, G. W., Logan.
Manan, C. F., Bower Mills.
Marlow, C. N., Marionville.
Masterson, Chas., Marionville.
Mathews, J. H., Mt. Vernon.
Mayhew, T., Marionville.
McCanse, J. W., Rural Route, Mt. Vernon.
McCanse, M. W., Mt. Vernon.
McClure, L. L., Marionville.
Means, Curtis, Pierce City.
Means, W. H., Marionville.
Miester, A. F., Pierce City.
Miller, Sherman, Stotts City.
Money, J. E., Aurora.
Moore, Chas., Stotts City.
Moore, Harry, Marionville.
Moore, Henry, Marionville.
Morris, I. V., Route 1, Stotts City.
Needham, S. E., Stotts City.
Orr, J. A., Mt. Vernon.
Pendleton, W. L., Route 3, Marionville.
Probasco, Ed., Route 1, Bower Mills.
Raydon, T. A., Route 1, Miller.
Rice, F. M., Verona.
Rodgers, J. H., Route 3, Box 39, Marionville.
Rutherford, Joe, Stotts City.
Seneker, J. E., Stotts City.
Seneker, Loran, Mt. Vernon.
Silverwood, C. E., Mt. Vernon.
Silverwood, Harry, Mt. Vernon.
Slater, W. F., Miller.
Sloan, J. D., Rural Route, Mt. Vernon.
Sloan, J. M., Marionville.
Stark, A. A., Logan.
Steward, Mary E., Route 2, Bower Mills.
Sugg, Thos. J., Aurora.
Suritt, H. H., Mt. Vernon.
Taylor, J. W., Route 1, Bower Mills.
Tarton, W. A., Route 2, Miller.
Torbett, T. P., Marionville.
Underwood, Otis, Route 1, Stotts City.
Vance, E. C., Pierce City.
Van Hatten, John, Verona.
Wheat, A. R., L. Box 53, Aurora.
Wheeler, W. E., Verona.
White, C. L., Aurora.
White, E. C., Aurora.
White, J. R., Route 1, Box 26, Aurora.
Whitmore, M. J., Hoberg.
Williamson, F. D., Mt. Vernon.
Williamson, S. D., Mt. Vernon.
Wuellner, C. E., Rural Route, Mt. Vernon.

LEWIS.

Brown, Asa, LaGrange.
Clark, Jesse, Canton.
Clark, Thos. A., Canton.
Stephenson, S. P., Route 2, Box 37, Canton.
Stickler, W. H., LaBelle.

LINCOLN.

Aston, R., Route 1, Truxton.
Brunnert, J., Route 1, Moscow Mills.
Cullers, W. A., Fairview.
Dowell, O. S., Route 5, Troy.
Elmore, T. J., Fairview.
Eydelotte, Scott, Route 1, Truxton.
Hoech, G. A., Route 1, Truxton.
Jenkins, E. C., Troy.
Johnson, Wm., Route 1, Hawkpoint.
Lewis, H. C., Whiteside.
Mabry, Wallace, Corso.
Mays, T. D., Elsberry.
Palmer, J. R., Elsberry.
Speed, John, Route 1, Truxton.
Strack, Herman, Route 1, Truxton.

Twellmann, Fred W., Troy.
Wilson, E. F., Route 1, Foley.
Wilson, J. F., Route 1, Foley.
Williams, A. H., Silex.
Young, Chas. W., Corso.

LINN.

Baker, L. D., Route 4, St. Catherine.
Buck, S. W., Bucklin.
Burch, D. D., Marceline.
Clothly, Chas., Marceline
Combs, W. H., Marceline.
Dyche, J. J., Linneus.
Early, Geo. W., Marceline.
Grambell, M. E., 625 N. Main St., Brookfield.
Gamble, Jos., Brookfield.
Hair, Jas., Route 5, Bucklin.
Haley, Arthur, Marceline.
Haley, David, Marceline.
Haney, A. J., Marceline.
Hardin, J. L., Marceline.
Hayes, Jos., St. Catherine.
Helwig, Milton, Marceline.
Hier, Jas., Marceline.
Hunter, J. E., Brookfield.
Kelsey, L. D., Brookfield.
Kelsey, S. E., 109 Monroe St., Brookfield.
Long, Irving, Marceline.
Maddox, R. C., Linneus.
Monroe, D. U., Marceline.
Myers, Harry C., Brookfield.
Porter, H. D., Marceline.
Porter, J. W., Marceline.
Powell, E. J., Linneus.
Rothe, Lee, Linneus.
Schnabel, John, Bucklin.
Shouse, W. S., Route 4, Brookfield.
Swan, A. P., Marceline.
Stevenson, Jos., Marceline.
Welsh, C. S., Laclede.
Waller, J. F., Marceline.
Williams, F. L., Marceline.
Wolf, Warren, Marceline.

LIVINGSTON.

Baker, W. H., Route 3, Chula.
Byler, W. H., Route 2, Wheeling.
Casebeer, Raymond E., Chula.
Curren, L. A., Chillicothe.
Gardon, W. C., 907 N. Elm St., Chillicothe.
Girls Industrial Home, Chillicothe.
Guymo, M. A., Route 3, Chillicothe.
Herriman, E. E., Route 2, Mooresville.
Howard, J. W., Chillicothe.
Hudgins, John, Route 1, Mooresville.
Jenkins, T. E., Route 4, Dawn.
Jordan, R. B., Chillicothe.
Mann, B. D., Mooresville.
Martin, Miss Rosa, Chillicothe.
Mathews, C. N., Chillicothe.
Metzner, Herman, Chillicothe.
Miller, E. J., Utica.
Moore, Allen, Chillicothe.
Mumpower, W. G., Chillicothe.
Murray, Dr. R. W., Ludlow.
Powell, J. Y., Chillicothe.
Smith, G. A., Chillicothe.

McDONALD.

Akelhurst, J. R., Arnett.
Baker, J. F., Jane.
Baker, W. H., Pineville.
Barnett, G. R., Route 2, Rocky Comfort.
Caldwell, C., Noel.
Calvert, J. W., Route 1, Noel.
Chamblis, W. J., Anderson.
Cloud, T. L., Goodman.
Davis, C. E., Noel.
Dean, H. E., Anderson.
Hall, Ivan, Noel.
Haskell, H. B., Anderson.
Hawkins, W. H., Anderson.
Hodge, Mrs. E. Hetherington, Anderson.
Key, E. W., Southwest City.
Kistler, A. J., Route 2, Rocky Comfort.
Lilly, J. B., Rocky Comfort.
McKenzie, G. M., Arnett.
Manning, J. S. W., Route 1, Anderson.
Marshall, F. A., Noel.
Millard, Ed. E., Anderson.
Moore, J. F., Elk Springs.
Patterson, Grover, Rocky Comfort.
Peacock, Jas. M., Rocky Comfort.
Petty, Clarence, Noel.
Roark, W. Ed., Anderson.
Robinson, C. B., Southwest City.
Smith, S. N., Anderson.
Stauber, J. B., Noel.
Taylor, W. C., Noel.
Thratchley, Thos., Route 3, Anderson.
Van Clitters, F. E., Anderson.
Van Matre, F. M., Noel.
Walters, A. C., Noel.
Whitmore, W. B., Goodman.
Wilson, J. N., Pineville.
Womack, W. D., Noel.
York, Jas., Noel.

MACON.

May, J. E., LaPlata.
Mitchell, J. E., Elmer.
Norfolk, Clift C., Route 2, Ethel.
Roberts, Mrs. D. A., New Cambria
White, W. H., LaPlata.

MADISON.

Blumer, A. A., Fredericktown.
Dines, Dr., Fredericktown.
Graham, N. B., Fredericktown.
Hall, S. W., Fredericktown.
Marshall, E. W., Fredericktown.
Thomas, Moses, Mine Lamotte.
Whitner, G. W., Fredericktown.

MARIES.

Klein, Emil, Steen Prairie.
Shanks, G. W., Summerfield.
Vanderpool, Wesley, Brinktown.

MARION.

Culp, C., Hannibal.
Cunningham, Scott, Palmyra.
Fette, C. M., Hannibal.
Neeper, Dr. H. R., Hannibal.
Rombuy, Will L., Route 3, Hannibal.
Terrill, J. R., Philadelphia.
Thacher, S. B., Hannibal.

MERCER.

Bristow, Dr. G. M., Princeton.
Caldwell, A. W., Milan.
Cooper, Marion, Half Rock.
Crawford, G. A., Saline.
DeWitt, L. A., Milan.
Foster, Cyrus F., Mercer.
Hazen, F. A., Half Rock.
Johnson, J. E., Princeton.
Jones, Roxana, Milan.
Lowry, Frank, Princeton.
Lowry, W. H., Mercer.
Page, Sam., Milan.
Pierce, Miss May, Princeton.
Rhoades, Melvin, Half Rock.
Smith, Lewis, Route 5, Princeton.
Wayman, H. S., Princeton.
Wendt, A. J., Half Rock.
Williams, S. G., Route 1, Princeton.

MILLER.

Adcock, W. B., Eldon.
Adkins, G. M., Eldon.
Agee, Olmer, Iberia.
Allen, J. B., Eldon.
Artez, John, Eldon.

Babcock, H. N., Aurora Springs.
Babcock, J. N., Eldon.
Barkelow, C. H., Eldon.
Benage, E. E., Iberia.
Brockman, John N., Eldon.
Burlingame, W. S., Olean.
Clarke, B. H., Cainby.
Coffman, C. B., Olean.
Crum, W. H., Olean.
Davidson, P., Aurora Springs.
Dooley, M. S., Eldon.
Fendore, W. A., Tuscumbia.
Foote, Chas., Eldon.
Francis, Lester, Iberia.
Gillelan, J. S., Olean.
Gilleland, J. L., Olean.
Godfrey, G. T., Eldon.
Goethe, Victor H., Blackmer.
Hanley, Thos., Spring Garden.
Haynes, J. J., Eldon.
Helfrick, J. R., Eldon.
Henley, T. J., Spring Garden.
Hodgden, H., Iberia.
Igo, Wilkin, Route 2, Eldon.
Iven, P. J., Mary's Home.
Lesher, J. G., Eldon.
Markelow, C. H., Eldon.
Moore, Dr. J. H., Iberia.
Nettleton, George, Aurora Springs.
Oviatt, F. L., Eldon.
Phillips, Henry, Eldon.
Robertson, R., Cainby.
Russell, Sam, Eldon.
Schott, G. H., Eldon.
Schupp, J. S., Eldon.
Shepherd, E. H., Eldon.
Shepherd, N. J., Eldon.
Shepherd, W. T., Eldon.
Starling, Fred, Olean.
Sumphins, J. S., Spring Garden.
Taylor, H. Clay, Eldon.
Trower, W. H., Eldon.
Vetter, John, Eldon.
Weaver, A. P., Eldon.
Weeks, E. G., Eldon.
Wegener, Rev. Julius, Eldon.
Yarger, W. H., Eldon.
Yount, A., Aurora Springs.

MISSISSIPPI.

Taylor, Wesley, East Prairie.
Deal, E. P., Charleston.

MONITEAU.

Boothe, Geo. F., Fortuna.
Boyd, Mrs. J. M., Tipton.
Crawford, J. H., California.
Donley, Earl, Clarksburg.
Gilbert, Lillian Virginia, Tipton.
Gordon, C. M., California.
McKinney, Thos., Fortuna.
Schmidt, P. J., Fortuna.
Stanton, W. W., Fortuna.

MONROE.

Briggers, T. A., Route 3, Paris.
Burnham, J. M., Duncan's Bridge.
Eubank, Clyde G., Madison.
Gentry, Frank, Monroe City.
Luttsell, Fred M., Paris.
Moore, T. S., Route 1, Paris.
Sohlinger, J. P., Stoutsville.
Symmonds, Mrs. Hershel, Monroe City.
Wilkerson, Chas., Madison.
Wilkerson, Kelly, Santa Fe.

MONTGOMERY.

Bishop, S. C., Route 3, Montgomery City.
Davis, Chas., Route 1, High Hill.
Ferguson, Lee, Jonesburg.
Fischer, Henry, Jonesburg.
Hess, Allen, Jonesburg.
Hilderbrandt, Otto, Jonesburg.
Leitch, T. C., Montgomery City.
Long, Frank, Jonesburg.
Mardoff, J. Wesley, Route 3, New Florence.
May, W. W., Route 2, Middletown.
Miller, G. H., Bluffton.
Morning, H. J., Bluffton.
Reutner, Frank, Route 1, Jonesburg.
Skinner, Robt. W., Jonesburg.
Stevens, John, Jonesburg.
Whitehead, A. B., Wellsville.
Wilson, Henry, Sr., Jonesburg.
Wilson, W. F., Jonesburg.

MORGAN.

Able, J. D., Versailles.
Bailey, S. P., Versailles.
Bishop, Henry, Todd.
Crewson, E. A., Versailles.
Holsapple, H. L., Versailles.
Laforest, Alfred, Stover.
Pontius, Uriah, Stover.
Weaver, Clarence, Route 1, Barnett.

NEW MADRID.

Matherson, A. G., New Madrid.
Mills, John N., Matthews.

NEWTON.

Allen, J. A., Diamond.
Allen, John, Diamond.
Anderson, Jean, Diamond.
Anderson, W. G., Neosho.
Apgar, J. F., 345 Ripley, Neosho.
Bailey, Chas., Neosho.
Banks, A. N., Neosho.
Baughman, A. L., Neosho.
Beard, W. H., Neosho.
Benintendi, O., Ritchey.
Benintendi, Mrs. F., Ritchey.
Bennett Fruit Farm, Neosho.
Blinn, C., Neosho.
Brown, W. T., Neosho.
Browning, Ben F., Seneca.
Brumback, R. H., 319 Lafayette St., Neosho.
Buckley, Mrs. Stella, Neosho.
Burkhart, Mrs. Maggie, Neosho.
Bushner, Chas., Neosho.
Bushner, Jacob, Neosho.
Buxton, Eliza, Neosho.
Cabble, H. A., Neosho.
Carmer, F. H., Route 1, Granby.
Carr, H. E., Route 1, Granby.
Cary, R. S., Stella.
Caroway, W. E., Diamond.
Chamberlain, F. M., Neosho.
Childress, J. M., Tiptonford.
Childress, Mary, Neosho.
Christian, J. H., Neosho.
Chute, Bert, Neosho.
Clement, S. D., Route 3, Granby.
Clemms, H. C., Neosho.
Clark, J. W., Route 1, Neosho.
Clark & Queener, Neosho.
Cobble, Earl, Neosho.
Cook, D. M. E., Neosho.
Corner, F. H., Route 1, Granby.
Coulter, E. N., Neosho.
Craig, John, Spurgeon.
Crayton, G. W., Route 2, Granby.
Crouch, E. W., Route 1, Granby.
Cullers, W. A., Route 1, Fairview.
Cullum, Elmer, Route 1, Diamond.
Cummings, J. R., Diamond.
Cupps, Dan, Route 2, Granby.
Cushman, E. J., Neosho.
Dorrence, G. E., Neosho.
Dedrick, Bert, Route 1, Seneca.
DeGraff, Miss M. M., Neosho.
Denham, A. W., Neosho.
Dewitt & Droutland, Neosho.
Donephant, R. W., Neosho.
Duncan, David S., Neosho.
Dunham, R., Neosho.
Edwards, P. E., Route 5, Neosho.
Elmore, T. J., Fairview.
Evans, Mrs J. A., Route 5, Neosho.

Fandreger, Gust, Route 3, Neosho.
Ferguson, Mrs. R. C., Neosho.
Ford, O. J., Neosho.
Foster, Miss Florine, Neosho.
Fowler & Son, C. H., Neosho.
Fowler, Edwin, Neosho.
Fox, H. G., Route 1, Granby.
Fullerton, J. H., Route 1, Granby.
Fullerton, Taylor, Route 1, Granby.
Giles, John, Neosho.
Gilmore, R. H., Route 1, Neosho.
Gleason, Silas, Route 1, Neosho.
Graham, S. W., Neosho.
Graves, Geo., Neosho.
Graves, J. B., Neosho.
Green, F. W., Granby.
Green, R. B., Neosho.
Griffith, Flora, Neosho.
Guthrie & Guthrie, Neosho.
Hall, John, Neosho.
Hamby, C. M., Route 37, Granby.
Hamby, J. E., Route 2, Neosho.
Hankins, C. H., Neosho.
Hargrove, J. J., Neosho.
Harris, D., Tiptonford.
Harris, Joseph, Granby.
Hash, J. H., Route 2, Granby.
Hawley, C. L., Neosho.
Heer, Chas., Route 2, Granby.
Heffington, S. A., Neosho.
Hendon, L. A., Route 1, Seneca.
Hill, R. D., Neosho.
Hobson, A. J., Route 7, Neosho.
Hope, Mrs. C. W., Neosho.
Hubbs, W. O., Neosho.
Hunter, J. B., Neosho.
Hurd, J. M., Neosho.
Hutchinson, Alfred C., Route 2, Neosho.
Jackson, Geo., Neosho.
Jackson, Mrs. Robt., Neosho.
James, S. L., Neosho.
Jeffries, L. W., Diamond.
Joines, J. F., Neosho.
Jones, J. M., Route 1, Granby.
Jones, John, Neosho.
Keagy, G. W., Route 1, Diamond.
Keagy, S. B., Route 1, Diamond.
Keller, W. J., Route 1, Diamond.
Kraft, Frank P., Neosho.
Laderach, John, Neosho.
Lakin, L., Neosho.
Landis, J. P., Neosho.
Liles, R. P., Neosho.
Link, J. L., Route 2, Granby.
Ledford, A. A., Neosho.
Long, Isaac, Neosho.
Marion, John, Route 3, Granby.
Mathis, Ira, Route 1, Neosho.
Matters, W. T., Neosho.
Mayes, Dan, Ritchey.
McCartney, H. A., Route 4, Neosho.
McGrew, Jessie, Neosho.
McIntosh, Mrs. M. W., Neosho.
McNallie, J. F., Chester.
McPherson, Mrs. Essie, Neosho.
Merrell, George, Route 1, Newtonia.
Messers, J., Route 2, Neosho.
Miller, Mrs. Wm., Granby.
Mills-Hawkins Co., Neosho.
Mock, J. S., Seneca.
Moffett, I. H., Seneca.
Moffett, Jas., Route 3, Neosho.
Moore, Rev., Diamond.
Morgan, Joe, Route 1, Granby.
Morgan, S. K., Neosho.
Musser, Jas., Route 2, Diamond.
Neosho Land & Fruit Co., Neosho.
Nicely, Mrs. S. E., Neosho.
Nunn, W. W., Granby.
Orrell, Philip, Route 1, Granby.
Osbourne, Harry I., Neosho.
Owens, John, Neosho.
Paige, O. L., Neosho.
Patterson, Enos, Route 2, Granby.
Penick, Mrs. S. O., Diamond.
Pflug, J. P., Neosho.
Pike, S., Neosho.
Proctor, J. B., Neosho.
Proctor, E. L., Neosho.
Propst, J. M., Neosho.
Quigley, Mrs. A. W., Neosho.
Rambo, Wm., Route 7, Neosho.
Rathel, J. E., Neosho.
Rawlins, Al, Route 1, Granby.
Rice, Miss Fanny, Neosho.
Richardson, Frank H., Neosho.
Richardson, H. G., Route 7, Neosho.
Richardson, J. H., Neosho.
Ross, P. A., Neosho.
Roy, J. W., Wentworth.
Rudy, R. B., Neosho.
Scandland, A. L., Neosho.
Schellenbauer, Mrs. W., Neosho.
Schupp, Fred, Neosho.
Schnaufer, W., Neosho.
Seagrove, John, Route 3, Neosho.
Seeley, J. F., Neosho.
Shuey, Allen, Neosho.
Shuey, S. L., Neosho.
Shuey, W. R., Neosho.
Shull, C. A., Neosho.
Shull, Chas., Wentworth.
Slage, S. L., Diamond.
Slame, S. L., Route 1, Diamond.
Slimp, W. H., Neosho.
Sloan, D., Neosho.
Smith, J. D., Neosho.
Smith, J. W., Route 2, Granby.
Staib, Chas., Neosho.
Stallard, J. B., Neosho.
Stanka, L., Neosho.
Starns, W. T., Route 3, Granby.
Stewart, W. L. H., Neosho.
Stone, Wm., Neosho.
Sweeney, W. A., Neosho.
Taiclet, F. A., Neosho.
Taylor, M. M., Neosho.
Thomas, David, Neosho.
Thomas, G. L., Neosho.
Tri-State Fruit Co., Neosho.
Turner, J. R., Route 2, Granby.
Walker, A. N., Neosho.
Walker, O., Neosho.
Walker, Sigel, Route 1, Seneca.
Walker, T. V., Route 2, Granby.
Wagner Bros., Neosho.
Ward, J. W., Route 2, Granby.
Warden, Lon, Diamond.
Weems, E. H., Newtonia.
Wells, B. P., Neosho.
West, Henry, Neosho.
White, T. M., Route 2, Neosho.
Widener, L. A., Route 2, Neosho.
Wilcox, J. D., Neosho.
Willard, J. D., Neosho.
Williams, C. L., Neosho.
Williams, F. V., Chester.
Williams, Mrs. Laura, Neosho.
Williams, Rev. W. H., Route 3, Neosho.
Williams, W. L., Route 1, Neosho.
Wilson, Jas. F., Neosho.
Withrow, J. M. Z., Neosho.
Wood, Jess, Route 2, Granby.
Woods, J. D., Neosho.
Wormington, T. M., Ritchey.
Wyatt, Jas., Neosho.
Wyatt, Scott, Neosho.
Yates Bros., Neosho.
Yates & Son, G. H., Neosho.
Youngblood, Geo., Route 1, Granby.

NODAWAY.

Behm, H. L., Hopkins.
Berg, W. A., Parnell.
Bram, Wm., Hopkins.
Graybill, Mrs. Lizzie, Hopkins.
Hogan, Albert, Box 220, Maryville.
Jean, T. J., Elmo.
Jackson, L. V., 204 E. First St., Maryville.
Kennedy, J. W., Parnell.
Malvern, Ed. N., Route 4, Burlington Junction.
Moore, Chas. C., North Main St., Maryville.
Payne, T. F., Parnell.
Smith, Jno., Parnell.
Stafford, Geo., Burlington Junction.
Wolfers, E. C., Bank of Hopkins, Hopkins.

OREGON.

Aronhalt, S., Myrtle.
Culver, T. M., Koshkonong.
Davis, U. G., Koshkonong.
Hardin, Jno., Koshkonong.
Haskins, Chas., Koshkonong.
Hitt's Sons, John W., Koshkonong.
Hitt, R. M., Koshkonong.
Meek, O. L., Koshkonong.
Nutt, Leon, Koshkonong.
Paynter, W. C., Koshkonong.
Perrin, A. S., Koshkonong.
Reed, C. O., Koshkonong.
Richardson, T. J., Koshkonong.
Smith, Will, Wilderness.
Wales, Alvin, Thayer.
Wilkerson, J. D., Koshkonong.

OSAGE.

Coffman, J. W., Chamois.
Heyer, H. D., Byron.
Hoffman, J. W., Chamois.
Iven, John H., Potts.
Johns, W. H., Aud.
Kramlich, Lorenza, Chamois.
Lageman, Walter, Chamois.
Pasquires, A. L., Bonnots Mill.
Rommel, Jacob, Chamois.
Thuli, J. A., Chamois.
Webb, Harry, Westphalia.

OZARK.

Davidson, J. R., Ella.
Davis, O. A., Sharp.
Mayfield, J. N., Trail.
Mayfield, W. J., Toccoa.
McGuire, Perry, A., Benners.
Rice, M. B., Udall.

PEMISCOT.

Brooks, W. C., Cooter.
Carmichael, Geo. T., Cooter.
Carter, W. H., Hayward.
Cunningham, J. A., Caruthersville.
Davis, E. S., Stanley.
Foust, R. E., Hayti.
Green, W. J., Covington.
Gwin, F. M., Hayti.
Gaither, J. W., Hayti.
Glasscock, J. M., Caruthersville.
Long, W. A., Braggadocio.
Long, F. L., Braggadocio.
Markey, S. S., Caruthersville.
Massey, H. L., Stanley.
Merrell, Geo., Hayti.
Reed, C. W., Hayti.
Samford, Robt., Samford.
Speer, Everton, Braggadocio.
Stephens, G. M., Caruthersville.
Stivers, C. H., Covington.
Ward, W. A., Caruthersville.
Warren, J. T., Wardell.

PERRY.

Bowman, H. L., Longtown.
DeLassus, Jesse F., Crosstown.
Hatch, G. S., Seventysix.
Schnidler, L. J., Perryville.
Silies, Geo. A., Perryville.

PETTIS.

Allen, W. I., Box 36, Sedalia.
Banning, R., Route 4, Sedalia.
Benz, Fred A., Sedalia.
Burgomaster, J., Smithton.
Carroll, M. V., Sedalia.
Deweese, A. J., Route 4, Sedalia.
Dugan, Mrs. E. W., Sedalia.
Fowler, J. A., Sedalia.
Green, C. B., Route 7, Sedalia.
Hall, Robt., Lamonte.
Hughes, F. M., Route 8, Sedalia.
Imhauser, Wm., Route 4, Sedalia.
Jackson, W. L., Smithton.
Kirk, L. T., Route 1, Beaman.
Lamm, Chas., Route 4, Sedalia.
Lamm, J. J., Route 4, Sedalia.
Landis, S. R., Beaman.
Marshall, Wm., Route 7, Sedalia.
McBride, E., Route 1, Smithton.
Monsees, Cnas., Route 2, Smithton.
Monsees, Henry, Route 4, Sedalia.
Monsees, M. A., Beaman.
Monsees, W. C., Beaman.
Morris, Henry, Route 4, Sedalia.
Norton, E. N., Route 4, Sedalia.
Pfaff, Mrs. W. H., Green Ridge.
Potter, J. A., Route 2, Green Ridge.
Silsby, S. J., Route 4, Sedalia.
Smith, D. H., 106A Broadway, Sedalia.
Smith, Walter L., Hughesville.
Smith, D. H., Sedalia.
Sneed, Harry, Smithton.
Steel, Mrs. W. D., Sedalia.
Stevens, C. R., Route 7, Sedalia.
Stevens, J. S., Route 4, Sedalia.
Stinson, J. T., Sedalia.
Thomas, J. H., Route 2, Sedalia.
Thompson & Son, B. K., Beaman.
Todd Bros., Sedalia.

PHELPS.

Boyce, J. H., Route No. 4, Rolla.
Buehler, H. A., State Geologist, Rolla.
Burgess, J. E., Rolla.
Calkins, Rolla D., Knobview.
Corse, Arthur, Rolla.
Davies, H. Rolla.
Gorton, J. A., Rolla.
Hinkle, Chas., Jacobs.
McGuire, M., Rolla.
Shumaker, H. G., Rolla.
Wall, A. M., Duke.
Williams, F. L., Route 2, St. James.

PIKE.

Crow, M. J., Louisiana.
Dawson, Mrs. J. B., Eolia.
Hickerson, S. J., Louisiana.
Ince, W., Louisiana.
Jordon, W. A., Louisiana.
Meriwether, J. D., Louisiana.
Motley, M. E., Bowling Green.
Naxere, Fred, Jr., Louisiana.
Pitzer, Walter R. R., Louisiana.
Pollak, A. E., Louisiana.
Rogers, J. A., Bowling Green.
Stark, C. M., Louisiana.
Stark, J. Ovid, Stark.
Stark, W. H., Louisiana.
Stark, W. P., Louisiana.
Treadway, O. H., Clarksville.
Wakeley, James, Louisiana.
White, W. M., Louisiana.
Wilson, E. M., Louisiana.

PLATTE.

Blakeley, Jesse J., Platte City.
Blakeley, Jim J., Route 2, Platte City.
Burgess, John J., Dearborn.
Chedester, F. P., Parkville.
Clark, W. H., Parkville.
Collins, Judge M. P., Platte City.
Cook, P. L., Parkville.
Darche, J. H., Parkville.
Dean, Prof. Howard, Parkville.
Fraker, James W., Route 3, Parkville.
Gabbert, Benton, Dearborn.
Harmon, J. S., Weston.
Higgins, W. W., Parkville.
Knighton, C. H., Parkville.
Layton, Judge Jas., Weston.
Lowmiller, Dan, Parkville.
Martin, M. F., Edgerton.
McAfee, H. B., Parkville.
McAdow, Jas., Iatan.

McAdow, John, Iatan.
McAdow, J. W., Weston.
Shonse, A. P., Weston.
Skillman, John, Platte City.
Thorp, Judge C., Weston.
Wightman, Prof. F. A., Parkville.
Wolf, Prof. A. D., Parkville.

POLK.

Engleman, Walter E., Fair Play.
Erhardt, Carl, Box 26, Dunnegan.
McCarthy, F. G., Route 7, Humansville.
Mieyer, Henry, Brighton.
Robertson, J. J., Route 2, Humansville.
Walker, J. H., Route 3, Humansville.
Williams, G. W., Humansville.
Winton, Chauncey, Dunnegan.

PULASKI.

Allen, E. H., Dixon.
Beasley, W. E., Swedeborg.
Bloom, R. J., Richland.
Clowers, J. L., Route 1, Dixon.
Davis, C. H., Richland.
Fehr, Wm. F., Franks.
Fox, Francis, Franks.
Garrington, G. F., Dixon.
Gibson, W. D., Dixon.
Guild, Geo., Franks.
Hartwich, A., Dixon.
Hill, S. C., Dixon.
Hill, Stephen E., Dixon.
Houk, Vasca, Dixon.
Jasper, Sam, Bloodland.
Johnson, J. L., Richland.
Lacey, Mrs. Louise, Richland.
Lane, L. W., Big Piney.
Leamont, John, Dixon.
Lynch, Thos., Dixon.
Miller, S., Richland.
Murphy, Chas., Dixon.
Murphy, T. A., Dixon.
Noe, E. E., Richland.
O'Connell, Jerry, Franks.
Page, B. F., Big Piney.
Page, S. N., Big Piney.
Polson, A. B., Route 1, Richland.
Ray, Monroe, Route 8, Dixon.
Reid, C. C., Richland.
Rohn, L. A., Tavern Route, Dixon.
Schraeder, C., Richland.
Seaton, W. H., Swedeborg.
Sewell, Harry, Dixon.
Sherwin, H. P., Dixon.
Skaggs, J. D., Hancock.
Thompson, R. B., Route 1, Hancock.
Veasman, Chris., Dixon.
White, W. G., Richland.
Wooley, J. O., Dixon.
Woolsey, Kenny, Dixon.

PUTNAM.

Jones, Lorenzo, Unionville.
Longhead, Josie E., Unionville.
Nulton, Geo. E., Worthington.
Nulton, John, Livonia.
Reed, John, Route 1, Lucerne.
Scott, J. T., Powersville.
Stout, Thos., Unionville.

RALLS.

Briscoe, Jack, New London.
Dalton, Col. Richard, Saverton.
Elliott, S. E., Perry.
James, A. C., New London.
Myers, C. E., Center.

RANDOLPH.

Buchanan, A. M., 221 S. 4th St., Moberly.
Burton, C. J., Yates.
Ferguson, Miss Lucy, Route 3, Huntsville.
Harris, J. T., Clark.
Harvey, F. B., Route 1, Moberly.
Heilmen, E., 105 South St., Moberly.
Kelso, Wm., Route 4, Higbee.
McKinney, Mrs. L. W., 129 Thompson St., Moberly.
Morton, E. D., Route 1, Clark.
Ratliff, G. N., Moberly.
Scott, A. L., Route 3, Moberly.
Summers, W. L., Clifton Hill.
Wayland, Loyd L., Moberly.

RAY.

Baxter, W. L., Lawson.
Colley, A. K., Orrick.
DeMink, Price D., Hardin.
Farrer, Jas. L., Jr., Richmond.
Paulson, Elmer A., Orrick.
Peterman, F. B., Lawson.
Riley, J. J., Richmond.

REYNOLDS.

Allen, W. W., Ellington.
Bowers, E. C., Ruble.
Gallaher, F. F., Ellington.
Gastinean, Guy, Ellington.
Kranel, W. J., Corridon.

RIPLEY.

Bradley, Geo. W., Jr., Doniphan.
Braschler, H. E., Doniphan.
Brooks, John A., Doniphan.
Carrico, John, Pine.
Cartell, John, Doniphan.
Clark, Leon, Doniphan.
Crim, Hasten, Doniphan.
Doherty, Thos., Doniphan.
Fogle, Ator, Briar Creek.
Frees, John, Doniphan.
French, G. W., Doniphan.
Gallup, W. A., Briar Creek.
Gary, W. E., Doniphan.
Gregg, M., Doniphan.
Hall, Geo. T., Poynor.
Hancock, W. C., Doniphan.
Harris, L., Doniphan.
Hart, J. P., Naylor.
Hodo, W. Carl, Bennett.
Hoskinson, Mrs. Nellie, Doniphan.
Jennings, J. W., Oxly.
Johnston, J. L., Doniphan.
Klem, J. F., Doniphan.
Lackey, W. C. S., Doniphan.
Lacy, Ed., Doniphan.
Lawrence, E. E., Doniphan.
Martin, C. K., Doniphan.
McCauley, J. R., Doniphan.
McCauley, M., Doniphan.
McClaren, J. A., Doniphan.
McLain, W. F., Doniphan.
Merrell, John, Doniphan.
Merrell, W. H., Doniphan.
Miller, P. E., Doniphan.
Mitchell, Jack R., Oxly.
Mixwell, J. O., Doniphan.
Moore, H., Doniphan.
Mutton, Albert, Doniphan.
O'Neil, John, Doniphan.
Pepmiller, H. B., Route 1, Doniphan.
Poudes, Mrs. Jane, Doniphan.
Price, A. W., Doniphan.
Price, E. W., Doniphan.
Quisenberry, H. B., Doniphan.
Randell, Austin, Doniphan.
Raney, J. H., Doniphan.
Raney, J. W., Doniphan.
Robertson, T. R., Doniphan.
Robertson, W. H., Doniphan.
Rogers, H. J., Fairdealing.
Russell, A. P., Doniphan.
Russell, Marion, Doniphan.
Salmon, A., Doniphan.
Salmon, Ed., Doniphan.
Seymore, J. J., Doniphan.
Sipes, Levi, Doniphan.
Smelser, F. E., Doniphan.
Sprague, A. L., Pine.

Stanton, Dewitt, Doniphan.
Stanton, S. D., Doniphan.
Steele, J. L., Doniphan.
Stevens, John, Doniphan.
Stillwell, John, Doniphan.
Tate, Samuel, Doniphan.
Thaxton, J. A., Bennett.
Towles, John, Doniphan.
Tschudin, Henry, Doniphan.
Wilson, Grant, Doniphan.
Williams, E., Doniphan.
York, Gillham A., Naylor.
Young, D. B., Route 1, Doniphan.

ST. CHARLES.

Algermessen, A., O'Fallon.
Benne, Louis H., Route 4, Box 16, St. Charles.
Deters, Geo., O'Fallon.
Edwards, Dr. J. C., O'Fallon.
Kemper, Capt., O'Fallon.
Lewis, Ed., O'Fallon.
Moser, John, O'Fallon.
Moser, Simon, O'Fallon.
Moser, Tony, O'Fallon.
Orb, Tony, O'Fallon.
Sattler, Lewis, O'Fallon.
Schreffer, Jacob, O'Fallon.
Solter, Miss Lydia, Route 4, St. Charles.

ST. CLAIR.

Gover, Ben, Iconium.
Harper, W. T., Collins.
Miller, F. H., Appleton City.
Munson, Lucis, Osceola.
Roeder, M. S., Osceola.

ST. FRANCOIS.

Albaugh, Austin, Farmington.
Beard, F., Bismarck.
Bertholdt, F., Bismarck.
Bismarck Gazette, Bismarck.
Bowman, J. J., Bonne Terre.
Bradley, Miss Mildred, Desloge.
Chandler, T. B., Route 3, Farmington.
Devine, J., Bismarck.
Devine, Wm., Bismarck.
Doss, F. W., Farmington.
Dunn, F. M., Route 4, Farmington.
Dyer, Bedo, Frankclay.
Forsythe, Robt., Farmington.
Garne, Anderson, Bismarck.
Geer, E. W., Farmington.
Gear Poultry Farm, Farmington.
Grayson, Miss Virginia, Desloge.
Hargrave, John, Farmington.
Heck, Thos., Route 2, Farmington.
Helber, J. W. S., Bonne Terre.
Highly, Maurice, Farmington.
Highly, T. J., Route 4, Farmington.
Hinze, M., Bismarck.
Hoy, W. F., Farmington.
Hughes, Miss Addie A., Bismarck.
Jaescke, R., Bismarck.
Knauss, H. C., Route 4, Farmington.
Koen, S. D., Esther.
Kopf, Wm., Bismarck.
Lucy, C., Bismarck.
Lynch, O. C., Farmington.
Mangan, J., Bismarck.
Martin, J., Bismarck.
McCoy, G., Bismarck.
McCoy, W. D., Bismarck.
Mitchell, Alfred, Esther.
Moody, Chas., Bismarck.
Moody, H. P., Bismarck.
Murphy, J. F., Bonne Terre.
Pressley, Miss Ethel, Bismarck.
Pressley, J. A., Bismarck.
Reynolds, J., Bismarck.
Richardson, Miss Beulah, Bonne Terre.
Robinson, J. M., Bismarck.
Schulz, Miss Katie, Bismarck.
Schulz, Wm., Bismarck.
Smith, Joe, Elvins.
Smith, Dr. Owen A., Farmington.
Steele, Chas., Bismarck.
Theilmann, Prof. Louis, Bonne Terre.
Vogt, Thos., Bonne Terre.
Whitner, H. S., Farmington.
Wilson, Robt., Bismarck.
Woodside, F. L., Box 171, Bonne Terre.
Wyatt, D. P., Bismarck.

STE. GENEVIEVE.

Braun, Xarrier B., St. Marys.
Fallert, Chas., Zell.
Kern, Louis P., Ste. Genevieve.
Vich, M., Ste. Genevieve.
Wood, J. J., Thurman.

ST. LOUIS.

Ahlers, H., Clayton.
Albrecht, G., Chesterfield.
Alexander, J. S., University City.
Angermieller, Geo. H., 1324 Pine St., St. Louis.
Armbruster, Ida, Route 2, Box 70, Clayton.
Barbee, Chas., Creve Coeur.
Batchelor, P. J., 2011 James St., St. Louis.
Bauer, Geo., Creve Coeur.
Baumann, A. S., Creve Coeur.
Baumgartner, Dolph, Route No. 10, Jefferson Barracks.
Beach, E. R., Globe-Democrat, St. Louis.
Bearss, A. M., 6533 Bartmer Ave., St. Louis.
Bellairs, J. W., Creve Coeur.
Bender, A., 6519 Crest Ave., St. Louis.
Benz, A., Creve Coeur.
Bernard, Peter, Route 9, Jefferson Barracks.
Bernard, S. K., Route 9, Jefferson Barracks.
Berning, Hy., 1402 Pine St., St. Louis.
Beynon, Chauncey L., 1435A Montclair Ave., St. Louis.
Bills, Albert, Jr., Creve Coeur.
Boden, Henry, Route 38, Anglum.
Bollman, A., Creve Coeur.
Bostic, Arthur E., St. Louis Public Library, St. Louis.
Bovier, E., Creve Coeur.
Broadhead, A. A., Clayton.
Brockmeier, J. C., Route 1, Clayton.
Broeker, Aug., Creve Coeur.
Bruce, R. E., 1405 Euclid Ave., St. Louis.
Bueller, Wm., Creve Coeur.
Buescher, Harry, Creve Coeur.
Buescher, Stephens, Creve Coeur.
Burns, Ruby, Hosmer Hall, St. Louis.
Campbell, Miss Sallie, Route 28, Wellston.
Cantwell, H. J., 819 Olive St., St. Louis.
Clark, Ed. P., Jr., Route 29, Box 241, Wellston.
Closs, F. W., Allenton.
Cochran, Albert, Route 28, Wellston.
Colman's Rural World, Holland Bldg., St. Louis.
Craighead, J. T., 502 S. 7th St., St. Louis.
Crecelius, John, Jefferson Barracks.
Danster, August, Route 4, Webster Groves.
Danster, Philip, Creve Coeur.
Davenport, Jno., Creve Coeur.
Deschamps, Alex., Creve Coeur.
Deutschmann, Chas., Route 29, Wellston.
Dierberg, Fred., Chesterfield.
Dierberg, Wm., Chesterfield.
Diestal, Herman, Creve Coeur.
Dorst, Wm., Route 9, Jefferson Barracks
Driemeier, Ed., Creve Coeur.
Dressel, Jno., Route 6, Webster Groves.
Eggesiecker, August, Creve Coeur.
Elgasser, Chas., Creve Coeur.
Emen, W. D., Creve Coeur.
Emil, Zanzie, Creve Coeur.
Evans, C. H., Evans Bldg., St. Louis.
Evans, James, Ferguson.
Fagan, Mike, Ferguson.
Farmer & Stockman, 727 Jaccard Bldg., St. Louis.

Farow, Celeste, Creve Coeur.
Fitzwater, Tyson, Creve Coeur.
Flier, John, Creve Coeur.
Flynne, Jos., 6412 Etzel Ave., St. Louis.
Foehringer, Chas., Route 13, Kirkwood.
Fry, W., Baden Station, Route 30, Box 35, St. Louis.
Fuchs, Miss C. F., Route 2, Clayton.
Fussner, Jacob, Creve Coeur.
Fussner, Joseph, Creve Coeur.
Galagher, Geo., Creve Coeur.
Galen, Frank, Creve Coeur.
Gardner, W. A., St. Louis.
Gaskill, I. S., Route 2, Clayton.
Gerhardt, C., Creve Coeur.
Gerhardt, Ed., Creve Coeur.
Gindra, Jno., 1853 S. 14th St., St. Louis.
Graeler, Ernest, Creve Coeur.
Graeler, Fred, Creve Coeur.
Graeler, Irvin J., Creve Coeur.
Greensfelder, M. B., Clayton.
Gregory, H. R., Century Bldg., St. Louis.
Hackmann, Henry, Creve Coeur.
Hackmann, H. H., Creve Coeur.
Hackmann, Oliver, Creve Coeur.
Harke, John, Ferguson.
Harker, F. J., Ferguson.
Harris, W. J., 3514 Lucas Ave., St. Louis.
Hart, A., Fenton.
Heckelman, John, Creve Coeur.
Hedges, E. S., Route 2, Clayton.
Hertel, Henry, Jr., Route 6, Affton.
Hezel, Chas., Creve Coeur.
Hezel, J. B., Creve Coeur.
Hoeh, H., Creve Coeur.
Hoffman, Robt., Creve Coeur.
Holekamp, Robt., A., 4263 Virginia Ave., St. Louis.
Horton, Francis, Route 29, Wellston.
Hunnicke, T. J., 3419 Arlington St., St. Louis.
Irish, Prof. H. C., Mo. Botanical Garden, St. Louis.
Jackson, Sam, 4852 St. Louis Ave., St. Louis.
Jacoby, John W., 2715 Big Bend Road, St. Louis.
Jensen, L. P., Busch Place, St. Louis.
Journal of Agriculture, 12th & Olive Sts., St. Louis.
Kaatmann, Henry, Creve Coeur.
Kaatmann, Jno., Route 4, Wellston.
Kaiser, Chas., Creve Coeur.
Kenhons, I., 3421 Wash. Ave., St. Louis.
Klingert, Stephen, Creve Coeur.
Koch, Albert A., Creve Coeur.
Koch, H. M., Creve Coeur.
Koch, Martin, Creve Coeur.
Koenig, B. J., Normandy.
Koenig, B. T., Normandy.
Koenig, John L., 6471 Florissant Ave., St. Louis.
Koenig, Otto G., 6473 Florissant Ave., St. Louis.
Kotsrean, F. K., 212 Euclid Ave., Webster Groves.
Kram, G., Chesterfield.
Kruger, Aug., Creve Coeur.
Kuoche, Geo., Creve Coeur.
Larsen, Dr. Geo. J. C., Tesson & Mattese Roads, St. Louis.
Lewis Pub. Co., St. Louis.
Louis, Sittemann, 2523 Glasgow Ave., St. Louis.
Lowe, Fred, Creve Coeur.
Luther, Wm., Route 9, Jefferson Barracks.
Luttmyer, Mr., Route 29, Wellston.
Mabrey, T. W., Jefferson St., Kirkwood.
Meavis, Hy., Creve Coeur.
Marshall, J. F., 4740 Easton Ave., St. Louis.
McBurney, W. J., 5872 Julian Ave., St. Louis.
McCorkle, H. D., 307 Temple Bldg., St. Louis.
Meinhardt, Fred H., 7041 Florissant Ave., St. Louis.
Meir, Henry, 428 Morganford St., St. Louis.
Merckel, Chas., Affton.
Meyer, A., 3218 S. Jefferson St., St. Louis.
Meyer, A., Jr., 3218 Missouri St., St. Louis.
Miller, G. F., Creve Coeur.
Miller, Theo., 4832 Delmar Blvd., St. Louis.
Moehner, Adolph, Route 7, Jefferson Barracks.
Moeller, G. H., Creve Coeur.
Molaries, Joe, Route 29, Wellston.
Moore, John, Lincoln Trust Bldg., St. Louis.
Moran, L., Main & Florida Sts., St. Louis.
Moreau, Aug., Creve Coeur.
Moreau, Chas., Creve Coeur.
Morris, B. W., Creve Coeur.
Moser, S. L., 3025 Locust St., St. Louis.
Mosley, Albert, Creve Coeur.
Mosely, Chas., Creve Coeur.
Mosley, Victor, Creve Coeur.
Mosley, Wm., Creve Coeur.
Muckermann, C., Creve Coeur.
Murtfeldt, Miss M. E., Kirkwood.
Muskoff, Hy., 23 Euclid Ave., St. Louis.
Muth, Dr. W. E., 501 Missouri-Lincoln Trust Co. Bldg., St. Louis.
Myers, H., Bridgeton.
Neff, Chas., Creve Coeur.
New, Florian, Creve Coeur.
Neideringhaus, Chas., Creve Coeur.
Neideringhaus, Fred, Creve Coeur.
Neideringhaus, Harry, Creve Coeur.
Neideringhaus, Wm., Creve Coeur.
Neihaus, Jno., Creve Coeur.
Nichol, W. F., 615 N. 4th St., St. Louis.
Niebling, F., 1915 McClaran Ave., Jennings.
Nuefer, B. C., 316 S. Jefferson Ave., St. Louis.
Nyflot, John, 7311 Florissant Ave., St. Louis.
Oge, Frank, Creve Coeur.
Ohlweiler, W. W., Mo. Botanical Garden, St. Louis.
Olderworth, Wm. D., Route 1, Clayton.
Olson, H., Webster Groves.
Oppermann, Anton, 2317 Edwards St., St. Louis.
Ortmann, Hy., Creve Coeur.
Ostertag, Geo., 1522 Deer St., St. Louis.
Ostertag, Hy. C., Jefferson & Washington Sts., St. Louis.
Ott, Frank, Clayton.
Pfeister, Brewster, Creve Coeur.
Pfeister, Dr. Jno. D., Creve Coeur.
Pfeister, W. F., Creve Coeur.
Phrouet, Peter, Pattonville.
Phrouet, Will, Bridgeton.
Plein, Aug., Creve Coeur.
Prince, A. K., 125 Orchard Ave., St. Louis.
Proestine, Hy., Creve Coeur.
Raab, Maurice, Creve Coeur.
Rabenau, Philip, Webster Groves.
Ranke, Reinhold, Creve Coeur.
Rausch, Louis, Creve Coeur.
Reese, Aug., 2516 N. 14th St., St. Louis.
Reinecke, C. F., Route 17, Glencoe.
Ritzler, Alois, Creve Coeur.
Rogerson, R. J., 4425 Delmar Blvd., St. Louis.
Rohan, Frank, Creve Coeur.
Rohan, Thos., Creve Coeur.
Rolston, R. C., 7100 Delmar Blvd., University City.
Rothenheber, Carl, Creve Coeur.
Rothenheber, E., Central.
Rothwell, Richard, Creve Coeur.
St. Louis Lumberman, The, Lumberman's Bldg., St. Louis.
St. Louis Public Library, St. Louis.
Sablier, Max, Creve Coeur.
Sanders, C. C., Clara & Delmar Blvd., St. Louis.
Sandoz, Aug., Creve Coeur.
Sandoz, Emil, Creve Coeur.
Sandoz, Fred., Jr., Creve Coeur.
Sandoz, Fred., Sr., Creve Coeur.
Sandoz, Sam, Jr., Creve Coeur.
Sandoz, Sam, Sr., Creve Coeur.

Sappington School Library, Webster Groves.
Schaupp, Chas., Creve Coeur.
Scheer, Jno., Sr., Creve Coeur.
Scheffing, Wm. J., Creve Coeur.
Scheffing, J. W., Creve Coeur.
Schisler, H. M., 813 N. 4th St., St. Louis.
Schneider, L. E., Room 210, Custom House, St. Louis.
Schoenen, Hugo, Kirkwood.
Scholz, Chas., 659 Kirkham Ave., Webster Groves.
Schrader, Chas., Creve Coeur.
Schray, Emil, 4101 Pennsylvania Ave., St. Louis.
Schreve, Fred, Creve Coeur.
Schulenburg, Hy., Route 9, Jefferson Barracks.
Schuelte, Henry J., Creve Coeur.
Schulte, Louis, Creve Coeur.
Schuttenberg, Aug., Creve Coeur.
Seeger, Fred, Creve Coeur.
Seeger, Geo., Creve Coeur.
Sherwin-Williams Co., Second & Clinton Sts., St. Louis.
Slough, Miss Gladys, 3901 Park Ave., St. Louis.
Smith, Chas. E., Creve Coeur.
Smith, Thos., Creve Coeur.
Snyder, P. H., Sr., Creve Coeur.
Star Farmer, The, 811 N. Tenth St., St. Louis.
Steidle, John, Central.
Stevens, W. J., Eugene Field School, St. Louis.
Stewart, Guy L., 1748 Pierce Bldg., St. Louis.
Stille, F. C., Route 29, Wellston.
Streicker, C. J., 6908 Bradley Ave., St. Louis.
Stock, Chas., Creve Coeur.
Stoye, Conrad, Creve Coeur.
Stoye, Jno., Creve Coeur.
Studt, F., Creve Coeur.
Studt, Jacob, Jr., Creve Coeur.
Studt, Oscar, Creve Coeur.
Sutter, Wm., Route 28, Wellston.
Tappmeier, Wm., Creve Coeur.
Taylor, W. H., 308 Odd Fellows Bldg., St. Louis.
Terry, Will, Pattonville.
Thies, H. W., Ferguson.
Thomassin, Alex., Creve Coeur.
Tonkins, Harry, Route 6, Sappington.
Trelease, Dr. Wm., Missouri Botanical Garden, St. Louis.
Tutty, Robt., Creve Coeur.
Uelk, S., Creve Coeur.
Ulrich, Jno., Creve Coeur.
Vogt, Ed., Clayton.
Vohsen, Jno., Creve Coeur.
Vohsen, Nick, Creve Coeur.
Von Schrenk, Dr. Hermann, Tower Grove & Flad Aves., St. Louis.
Wagner, Harry, Creve Coeur.
Waldbart, Alex, 5900 Horton Place, St. Louis.
Waldbart, Geo., 516 N. Grand Ave., St. Louis.
Walder, Chris., Route 29, Wellston.
Wallis, Henry, Sr., Route 28, Wellston.
Weber, Frank A., Nursery.
Weber, Fred C., 4326 Olive St., St. Louis.
Weber, Fred H., Boyle & Maryland Sts., St. Louis.
Weber & Sons, H. J., Nursery.
Wehrle, Wm., Creve Coeur.
Werder, Fred, Ferguson.
Whetton, A. L., 4805 Leduc St., St. Louis.
Whipke, Wm., Creve Coeur.
Widmann, O., 5105 Morgan St., St. Louis.
Wiegrand, Geo., Bridgeton.
Wilkinson, Judge W. R., 410 N. Main St., St. Louis.
Will, Dr. S. J., Route 8, Jefferson Barracks.
Williams, W. J., 6444 Marquette Ave., St. Louis.
Windler, Geo. B., 4059 Delore St., St. Louis.
Windt, Rudolph, 901 Bayard Ave., St. Louis.
Winter, Wm., Kirkwood.
Wolz, Fred, Route 7, Jefferson Barracks.
Wood, Miss Grace, Route 2, Box 99, Clayton.
Worting, John, Creve Coeur.
Wulf, L. F., Glencoe.
Young, Harry, 5311 Waterman Ave., St. Louis.

SALINE.

Bargman, Albert, Slater.
Barrett, J. M., Route 2, Napton.
Donohoe, J. V., Sweet Springs.
Edwards & Sons, J. D., Marshall.
Elsner, Harry L., Sweet Springs.
Floyd, A. C., Blackburn.
Greis, Gustav, Nelson.
Huston, W. S., Marshall.
Jones, F. D., Route 6, Marshall.
Liable, Rev. E., Napton.
Masters, John L., Sweet Springs.
Pelot, J. M., Sweet Springs.
Renken, Hermann, Sweet Springs.
Robertson, R. Gaines, Route 5, Marshall.
Schanz, Louis W., Route 1, Blue Lick.
Stedem's Stock Farm, Route 3, Marshall.
White, N. R., Napton.

SCHUYLER.

Higbee, Walter, Lancaster.
Womack, A. C., Downing.
Womack, A. L., Downing.

SCOTLAND.

Carder, W. E., Route 3, Rutledge.
Clinton, Mrs. M. E., Gorin.
Douglass, John, Route 1, Rutledge.
Wieland, W. G., Memphis.
Witt, R. D., Rutledge.

SCOTT.

Kingsbury, R. A., Benton.
Stewart, T. J., Sikeston.

SHANNON.

Baker, A. C., Oakside.
Baker, H., Monteer.
Boram, R., Monteer.
Carlstead, W. W., Congo.
Carr, W. M., Oakside.
Deal, R., Birch Tree.
Holt, Jos., Monteer.
Hunsecker, Sol., Monteer.
Kirkendall Fruit Farm, Birch Tree.
Kirkendall, V. H., Birch Tree.
Light, Miss Myrtle, Monteer.
Meeker, D., Birch Tree.
Randoph, W. J., Eminence.
Rymers, M. J., Birch Tree.
Wright, Wm., Monteer.

SHELBY.

Byron, W. S., Shelbina.
Davis, Oscar L., Route 3, Shelbina.
Green, Rev. Jas. Preston, Shelbina.
Statcup, J. J., Lentner.
Wood, J. L., Route 3, Lentner.

STODDARD.

Bauscher, A. S., Dexter.
Campbell, Geo. S., Puxico.
Chapman, Stephen, Bloomfield.
Reed, C. E., Route 2, Puxico.
Sparkman Nursery, F. O., Bloomfield.
Walden, G. E., Acorn Ridge.
Willis, C. C., Route 2, Puxico.

STONE.

Brasseau, J. B., Oto.
Craig, W. D., Galena.
DeGroff, C. E., Notch.
Ellis, Isaac, Crane.
Grigsby, C. L., Elsey.
Hageman, C. E., Galena.
Mellette, Arthur C., Galena.
Smith, Thos. H., Galena.

SULLIVAN.

Baldridge, R. L., Milan.
Booth, I. R., Milan.
Brantley, Lee, Newtown.
Campbell, A. D., Milan.
Chandler, John, Newtown.
Chandler, Marion, Newtown.
Fanning, Loyd D., Route 2, Milan.
Guthrie, B. F., Milan.
Harris, Geo. R., Box 115, Winigan.
Hayes, Jno. H., Route 3, Harris.
Henley, J. V., Green Castle.
Lane, C. J., Route 3, Green Castle.
Lane, E. F., Route 3, Milan.
Miller, F. E., Route 1, Green Castle.
Morlan, S. E., Pollock.
Murphy, Wm., Route 2, Cora.
Nowlin, F. M., Newtown.
Price, J. D., Route 3, Green Castle.
Reese, Aug., Sullivan.
Ross, Nelson, Newtown.
Royston, W. E., Green Castle.
Ryan, Patrick, Route 3, Milan.
Scobee, Geo. W., Pollock.
Smith, N. A., Pollock.
Thompson, Harvey, Harris.
Van Dusen, R. E., Pollock.

TANEY.

Anderson, W. N., Melva.
Ayers, Vince, Nance.
Blair, John, Hercules.
Branson, Tom, Kirbyville.
Burnside, Homer, Hercules.
Callen, Dr., Kirbyville.
Clemons, Chas., Taneyville.
Combs, Enoch, Goodloe.
Conner, Rev. Geo., Protem.
Cook, Jas. A., Bluff.
Cox, Jas., Gretna.
Dyer, Wm., Taneyville.
Eldridge, Dike, Goodloe.
Gann, Geo., Protem.
Gibson, Ira L., Rill.
Goetz, Jacob, Rueter.
Harford, H. C., Gretna.
Haskins, G., Protem.
Heryford, I. W., Branson.
Hutchins, Elbert, Protem.
Irvine, Will, Branson.
Jackson, Wm., Hollister.
Kelley, M. B., Goodloe.
Logan, E., Hollister.
Lynch, Dan, Taneyville.
Madden, Chas., Goodloe.
Mahnkey, P. C., Kirbyville.
McFarland, Alex., Branson.
Owens, John, Protem.
Peterson, Elsie, Hill Crest.
Rueter, H. H., Rueter.
Rittenhouse, Dave, Kirbyville.
Stevens, Van, Branson.
Storms, A. J., Hollister.
Tennison, Ben, Rueter.
Thurman, Gen., Branson.
Wilt, Irvine E., Swan.
Wright, Tom, Kirbyville.

TEXAS.

Bradford, C., Kinderpost.
Dempsey, E., Houston.
DuBois, F. E., Cabool.
Fogerson, Mrs. Ora, Fowler.
Gitt, C. W., Cabool.
Greely, R., Summerville.
Herrick, H. J., Houston.
Hoffarth, Miss A., Bendavis.
Lareau, Miss Addie, Cabool.
Livesay, Gilmore, Houston.
Locke, Jos., Summerville.
McAnelly, G. M., Houston.
Miller, Mrs. H. C., Kinderpost.
Moore, L. N., Cabool.
Parks, C. W., Maples.
Payne, J. O., Supt. School, Summerville.
Peterson, N. O., Route 3, Cabool.
Sisk, D. L., Licking.
Turner, G. W., Roby.
Vollman, Ed., Houston.
Wheeler, Judge E. H., Yukon.
Williams, W. J., Cabool.

VERNON.

Brown, Sam J., Nevada.
Crawmer, W. E., Moundville.
Crayton, G. W., Route 2, Granby.
Daniels, W. D., Route 1, Deerfield.
Errett, H. E., Nevada.
Emery, Harvey, Route 1, Moundville.
Faith, Jacob, Montevallo.
Frasse, Casper, Route 1, Nevada.
Glimpse, D., Nevada.
Gray, W. A., Route 1, Schell City.
Hankinson, Ben., Nevada.
Hartzfield, Jas. H., Route 1, Bronaugh.
Hawkins, N. S., Bronaugh.
Hickman, J. W., Nevada.
Hill, Geo. W., Nevada.
Huff, H. M., Deerfield.
Kaupp, G. A., Nevada.
Litson, W. H., Nevada.
Loher, H., Nevada.
Mesplay, W. L., Nevada.
Mitchem, D. B., Nevada.
Mitchem, S. V., Nevada.
Pierce, G. T., Nevada.
Potter, C. W., Nevada.
Rhodes, Chas. E., Nevada.
Shipley, J. N., Nevada.
Skinner, W. B., 405 College St., Nevada.
Storms, J. W., Nevada.
Swainson, Per., Nevada.
Weisberg, A. H., Nevada.

WARREN.

Backs, Herman, Route 3, Warrenton.
Barringhaus, J., Marthasville.
Baumann, Chas., Route 5, Warrenton.
Baurichter, Fritz, Route 4, Warrenton.
Bettembrock, F., Route 4, Warrenton.
Block, Geo., Route 4, Warrenton.
Boekemeyer, Louis, Route 5, Warrenton.
Bothe, Henry, Route 2, Warrenton.
Brandt, Aug., Route 3, Warrenton.
Buescher Bros., Route 1, Warrenton.
Clise, Thos., Route 3, Warrenton.
Dieckmann, Wm., Route 2, Warrenton.
Dolrich, John, Warrenton.
Dothage, Henry, Route 3, Warrenton.
Dothage, Wm., Route 3, Warrenton.
Drunert, H. C., New Truxton.
Drunert, Orlando, Warrenton.
Ebeling, A. W., Central Wesleyan College, Warrenton.
Eichmeyer, Conrad, Marthasville.
Ereiser Mfg. Co., Truesdale.
Gerdemann, R., Route 1, Warrenton.
Hafner, Louis, Case.
Hagermann, P., Wright City.
Hamback, Frank, Route 4, Warrenton.
Hancock, W. W., Route 2, New Truxton.
Haussmann, Otto, Route 1, Warrenton.
Hegemann, A. H., Route 1, Warrenton.
Hollmann, Aug., Route 2, Warrenton.
Howell, Harry, Route 1, Warrenton.
Huckriede, Capt. F., New Truxton.
Humphrey, Dick, Route 3, Warrenton.
Jordan, A., Gore.
Kent, L., Wright City.
Knapp, Geo. F., Pendleton.

Knipmeyer, Chas., Route 2, Warrenton.
Kock, Theo., Holstein.
Landnekr., Chas., Route 2, Warrenton.
Lefholz, Dick, Case.
Lesh, Allen, Wright City.
Litchlenberg, Simon, Route 3, Warrenton.
Linnert, Wm., Route 2, Warrenton.
Lix, C., Route 1, Warrenton.
Luppold, Mat., Case.
Maxel, S. H., Route 2, Warrenton.
Meinerschegen, Aug., Route 1, Warrenton.
Mueller, Fritz, Route 4, Warrenton.
Nichuss, Paul, New Truxton.
Parker, A. H., Route 1, Warrenton.
Poeppelmeyer, F., Route 3, Warrenton.
Polster, Gus. C., Warrenton.
Preul, Chas., New Truxton.
Reese, Aug., Route 2, Warrenton.
Reese, Wm., Route 2, Warrenton.
Requart, Herman, Route 5, Warrenton.
Schmidt, Conrad, Case.
Schnarre, Henry, Marthasville.
Schotte, Louis, Route 3, Warrenton.
Schowe, Henry, Route 5, Warrenton.
Schroeder, Julian, Route 3, Warrenton.
Schroes, D. R., Route 3, Warrenton.
Schwartze, Louis, Route 3, Warrenton.
Sellenschuettes, Henry, Route 3, Warrenton.
Siekmann, Gottlich, Gore.
Smith, E. R., Route 2, Warrenton.
Splitt, M., Case.
Sprick, E. R., Route 5, Warrenton.
Vahle, F. H., Route 2, Warrenton.
Vahle, Henry, Route 2, Warrenton.
Wegener, Henry, Route 4, Warrenton.
Wegener, John, Route 4, Warrenton.
Welge, Fritz, Marthasville.
Winter, Aug., Route 3, Warrenton.
Winter, F. A., New Truxton.

WASHINGTON.

Bennoist, P., Irondale.
Greenlee, E. F., Anthonies Mill.
Koupal, Matt., Peoria.
Moore, Geo. B., Mineral Point.
Riehl, W., Potosi.
Sylvester, P. K., Topozark.

WAYNE.

Barks, David, Lowndes.
Bettis, Abe., Wappapello.
Bundy, T. B., Piedmont.
Clise, Thos., Warrenton.
Collins, T., Box 315, Piedmont.
Fox, W. D., Shook.
Graham, Albert, Wappapello.
Grisham, Jas., Lowndes.
Grisham, Lindley, Lowndes.
Haire, G. S., Shook.
Harrell, John M., Wappapello.
Hear, G., Shook.
Helm, J. F., Shook.
Helm, J. H., Shook.
Henson, Leander, Gads Hill.
Herald, John, Wappapello.
Jones, J. E., Shook.
Johnson, Judge C. F., Greenville.
Julian, J. A., Wappapello.
Keena, Thos., Wappapello.
Long, S. B., Shook.
Maxwell, W. J., McGee.
McClure, Chas., Shook.
McCurbim, S. C., Shook.
McGowen, Joe, Wappapello.
Morgan, J. C., Wappapello.
Morgan, J. M., Wappapello.
Overfelt, G. P., Wappapello.
Parrish, G. W., Shook.
Powers, Sheridan, Wappapello.
Rector, A. J., Wappapello.
Richmann, Chris., Lowndes.
Sebastian, A. A., Bounds.
Searcy, E. L., Wappapello.
Taylor, R. E., Piedmont.
Underwood, L. R., Shook.
Vogle, John, Wappapello.
Ware, John, Wappapello.
Wyle, Henry, Wappapello.
Young, John H., Piedmont.

WEBSTER.

Anthony, T. G., Seymour.
Black, S. D., Fordland.
Brown, Thos., Seymour.
Childress, C. T., Seymour.
Childress, G. L., Seymour.
Childress, J. F., Seymour.
Dalrymple, H. L., Marshfield.
Gage, A., Seymour.
Gentry, W. S., Seymour.
Jacobsen, N. P., Route 3, Seymour.
Jacobsen, U. P., Route 3, Seymour.
James, Dr. E. F., Marshfield.
Johnson, S. C., Seymour.
Kindrick, H., Seymour.
Kuhnell, Mrs. L., Seymour.
Leathers, Fredrick, Seymour.
Long, W. I., Marshfield.
Love, T. C., Seymour.
Lusk, J. L., Elkland.
Martin, F. S., Forkner's Hill.
McMahon, James, Seymour.
Murray, F. A., Seymour.
Nelson, J. W., Marshfield.
Orem, A. S., Marshfield.
Parker, Geo. F., Seymour.
Parker & Co., Seymour.
Peer, C. O., Marshfield.
Peer, S. L., Marshfield.
Scott, W. H., Marshfield.
Shanks, G. W., Marshfield.
Shannon, W. C., Marshfield.
Smith, E., Seymour.
Terkildsen, Peter K., Route 4, Marshfield.
Trimble, S. C., Seymour.
Tucker, E. P., Marshfield.
White, L. J., Seymour.
Whitmer, L. S., Seymour.
Williams, F. A., Seymour.
Winans, L. M., Seymour.
White, Dr. S. L., Seymour.

WORTH.

Andrews, H., Grant City.
Andrews, Jas., Sheridan.
Bressler, M., Grant City.
Clary, J. E., Sheridan.
Coy, J. L., Sheridan.
Campbell, Claude, Grant City.
Davidson, O. H., Sheridan.
Duncan, E. W., Sheridan.
Dunfee, Judge, Denver.
Engle, Jesse, Sheridan.
Graham, J. C., Sheridan.
Gates, W. E., Sheridan.
Hurley, I., Grant City.
Jenkins, L. H., Sheridan.
Jones, A. M., Grant City.
Merckling, Judge G. A., Grant City.
Ross, C., Grant City.
Sanders, V. H., Sheridan.
Slater, J. M., Sheridan.
Simpson, J. E., Sheridan.
Tate, Fred, Sheridan.
Wilson, T. J. Allendale.
Winemiller, Ben., Sheridan.
Worth, Jas., Worth.

WRIGHT.

Allgeier, H. F., Mt. Grove.
Brooker, Mrs. C. B., Mt. Grove.
Brooker, E. W., Route 2, Mt. Grove.
Chandler & Son, Mt. Grove.
Cisna, S., Mt. Grove.
Clary, J. A., Mt. Grove.
Coloni, L., Mt. Grove.
Colvin, L., Mt. Grove.
Crane, Geo., Mt. Grove.
Dale, L. F., Mt. Grove.
Dale, L. J., Mt. Grove.
Evans, Paul, Mt. Grove.

Faurot, F. W., Mt. Grove.
Fischer, E. F., Mt. Grove.
Fraser, D. J., Mt. Grove.
Fuerst, A. A., Mt. Grove.
Grantham, R. R. C., Mt. Grove.
Hicks, W. S., Mt. Grove.
Keller, Miss Anna, Mt. Grove.
Keller, Miss Kate, Mt. Grove.
Keller, Harry, Mt. Grove.
Keller, H. S., Mt. Grove.
Killman, G. S., Mt. Grove.
Klam, P., Route 2, Mt. Grove.
Kropp, Peter, Mt. Grove.
Lane, Dr. I. R., Mt. Grove.
Lane & Lane, Mt. Grove.
Last, A., Mt. Grove.
Leonard, J. S., Mt. Grove.
McCann, C. A., Mt. Grove.
Moore, Mrs. A. Z., Mt. Grove.
Newby, J. H., Mt. Grove.
Newton, Tyre L., Hartville.
Porter, Mrs. M. S., Mt. Grove.
Quisenberry, T. E., Secy. State Poultry Board, Mt. Grove.
Robinson, J. C., Mt. Grove.
Rose, H. M., Mt. Grove.
Schofield, W. H., Mt. Grove.
Simon, B. F., Mt. Grove.
Titus, R. R., Mt. Grove.
White, Miss B., Mt. Grove.
Williamson, A., Mt. Grove.

ALABAMA.

Moss, Jessie S., Huntsville.
Watkins, J. P., Ozark.
Williams, Prof. P. F., Auburn.
State Horticultural Society, Auburn.

ARKANSAS.

Adams, W. W. & R. M., Ozark.
Agin, Wm., Pea Ridge.
Allen, S. D., Mena.
Anderson, A. J., Bentonville.
Attlee, F. M., Siloam Springs.
Austin, J. S., Mena.
Babcock, F., Greenwood.
Bachman, Jos., Ozark.
Bair, I. L., Bentonville.
Ballard, A. H., Piggott.
Bales, F. N. F., Mena.
Barton, John H., Fayetteville.
Bates, F. M., Bentonville.
Bates. S. J., Bentonville.
Beauchamp, E. L. E., Mena.
Beaton, Mrs. C. P., Mena
Bellamy, E. C., Mammoth Spring.
Berry, Lewis, Bentonville.
Blevens, Jessie C., Bentonville.
Blocker, S. J., Bentonville.
Blooms Bros., Bentonville.
Boatchie, Geo. D., Mena.
Boyce, Miss Fannie M., Tuckerman.
Brisendine, J. D., De Queen.
Britt, James J., Bentonville.
Brogden, W. B., Springdale.
Bronson, B. B., Bentonville.
Brown, Wilson, Bentonville.
Brown, W. H., Hungington.
Browne, J. T., Bentonville.
Browne, J. V. P., Clarksville.
Brusse, G., Decatur.
Bull, Dr. W. J., Mammoth Spring.
Burnskog, C. L., Bentonville.
Burks, W. A., Bentonville.
Burnett, J. M., Mena.
Butras, La Follette, Siloam Springs.
Butts, Frank, Mena.
Byler, J. D., Bentonville.
Caldwell, M. F., Staunton.
Canahan, H. P., Bentonville.
Carter, A. D., Mena.
Cardwell, Wilson, Springdale.
Cheney, Gill, Centerton.
Chiles, H. C., Pea Ridge.
Chiles, J. F., Gravette.
Clark, W. R., Bentonville.
Coleman, C. B., Bentonville.
Conover, Prof., Mammoth Spring.
Cody, W. R., Rogers.
Cook, G. W., De Queen.
Cooper, Elmer, Mammoth Spring.
Cormack, Richard, Centerton.
Cotton, Dr. N. B., Bentonville.
Confare, H. O., Bentonville.
Covey, J. D., Bentonville.
Cox, J. R., Waldron.
Craig, C. R., Bentonville.
Crowder, C., Bentonville.
Cumbie, N. G., Greenwood.
Cumbie, R. C., Greenwood.
Daniel, Tom, Mammoth Spring.
Davey, W. H., Siloam Spring.
Davis, G. C., Bentonville.
Davis, H. A., Fayetteville.
Deason, J. M., Rogers.
Dickson, Alvin, Rogers.
Dodd, John, Mena.
Dunham, R. W., Sulphur Springs.
Duke, W. J., Bentonville.
Edwards, J. W., Mena.
Edwards, W. N., Big Fork
Eld, C. J., Bentonville.
Engstrom, J., Bentonville.
Eubanks, F. G., Decatur.
Evans, Mrs. A., Eureka Springs.
Faris, J. C., Centerton.
Farris, F. M., Clarksville.
Ford, C. A., Siloam Springs.
Fore, W. R., Bentonville.
Foster, Sol, Bentonville.
Fowler, H. Z., Mena.
French, E. J., Mammoth Spring.
Garland, J. C., Acorn.
Gatlin, Asa, Mena.
Gifford, Ira, Mena.
Giger, Julius, Bentonville.
Gipple, H. W., Bentonville.
Gizer, Julius, Bentonville.
Goode, S. W., Rogers.
Goodwin, E. W., Mena.
Gosher, E. H., Gravette.
Graham, S. W. J., Springdale.
Greene, Frank, Farmington.
Hall, F. A., Fayetteville.
Hall, H. H., Ozark.
Hamilton, J. H., Mena.
Hamilton, E. M., Mena.
Hand, W. W., Elm.
Hart, T., Mena.
Hartzog, Henry R., Fayetteville.
Harvey, C. W., Mena.
Hayhurst, Prof. Paul, Fayetteville.
Haynes, E. J., Mena.
Head, S. P., Mammoth Spring.
Hedges, C. S., Decatur.
Heine, Henry, Mammoth Spring.
Helvern, D .S., Mammoth Spring.
Hennon, J. C., Bentonville.
Henry, J. A., Staunton.
Henthorn, I., Bentonville.
Hewitt, Prof. J. L., Fayetteville.
Hill, C. F., Mena.
Hinman, Geo. B., Bentonville.
Hopkins, E. M., Mena.
Howard, John, Pitts.
Howard, John, Bentonville.
Hubbard, W. H., Siloam Springs.
Hutchinson, L. E., Rudy.
Hutton, W. T., Clifty.
Hynson, P. B. P., Mammoth Spring.
Irwin, A. L., Rogers.
Jackson, G. P., Bentonville.
Jackson, J. M., Bentonville.
Jefferson, C. P., Bentonville.
Jenkins, W. W., Bentonville.
Johnson, A., DeQueen.
Johnson, B. W., Midland.
Johnson, J. A., Blackburn.
Jones, W. M., Alma.
Jones, J. J., Bentonville.
Jones, T. H., Big Fork.
Keith, B. E., Bentonville.
Kelly, W. D., Mena.

King, H. Y., Rogers.
King, T. S., Knoxville.
Kirsch, Mrs. John, Mena.
Koons, Auson, Centerton.
Lawson, Robert, Bentonville.
Lawton, I. B., Bentonville.
Leathers, J. R., Mena.
Lee, R. E., Decatur.
Leeper, J. W., Mena.
Leib, J. L., Bentonville.
Leiderman, H. D., Mena.
Lenkens, H. A., Bentonville.
Lincoln, Capt. G. T., Bentonville.
Lingeilach, Henry, Ridge.
Lowry, J. C., Mena.
Lukens, H. A., Bentonville.
McAndrew, J. H., Bentonville.
McCollom, R. C., Staunton.
McCormick, T. H, Bentonville
McGill, L H., Bentonville.
McMullen, R. C., Dardanelle.
Mackey, F. O., Bentonville.
Mackey, Oscar, Bentonville.
Manck, W. D., Bentonville.
Markham, L. A., Agrl. Dept., Mo. P. Ry., Little Rock.
Matheng, Mrs. B. E., Indsonia.
Maxson, R. S., Gentry.
Mayes, S. J., Clarksville.
Mayer, Mr., Mammoth Spring.
May, T. R., Mena.
Miser, John, Pea Ridge.
Moore, L. C., Piggott.
Morgan, E. S., Garfield.
Morris, J. M., Pea Ridge.
Morris, R. S., Siloam Springs.
Murray, W. E., Mena.
Nailer, J. W., Mena.
Neilson, John, Mammoth Spring.
Neithercut, Geo., Pea Ridge.
Nelson, S. H., De Queen.
Oakley, H. A., Rogers.
Ohler, O. H., Ozark.
Ortleib, Fred, Mena.
Pace, L. A., Bentonville.
Pardal, W. E., Staunton.
Patterson, H., Pea Ridge.
Patterson, W. F., Pea Ridge.
Peel, D. W., Bentonville.
Plank, E. N., Decatur.
Plank, W. H., Decatur.
Poole, A. W., Ozark.
Porter, H. C., Fayetteville.
Proctor, T. S., Mena.
Rathburn, H., Mena.
Reed, W. E., Mena.
Reeves, J. D., Lexington.
Robbins, N. J, Bentonville.
Rodgers, Philo., Gravette.
Rodgers, Sen. P. A., Gravette.
Rucker, J. C., Bentonville.
Rudolph, B. A., Fayetteville.
Rutherford, J. P., Staunton.
Quigley, R. M., Mena.
Sanders, W. H., Ozark.
Schmelzer, F. H., Van Buren.
Scott, A. P., Hackett City.
Sharp, I. A, Mammoth Spring
Shelton, S., H., Bentonville.
Smith, H. C., Bentonville.
Shibly, J. S., Van Buren.
Shibly, W. H. H., Van Buren.
Shirley, J. J., Mena.
Simms, W. W., Rogers.
Smallwood, N. D., Mena.
Smith, A. W., Mena.
Smith, J. C., Mena.
Smith, J. S., Route 2, Rogers.
Smith, W. Saul, 2218 Battery St., Little Rock.
Somers, Edward, Rogers.
Spring, T J., Mena.
Stark, Carl, Bentonville.
Stearns, Mrs. A. L., Fayetteville.
Stephens, A. F., Gravette.
Stewart, S. W., Van Buren.
St. John, Mrs. A. W., Mena.
Stockton, Jasper, Hatfield.
Stone, Taylor, Bentonville.
Storey, A. B., Greenwood.
Strange, Wm., Piggott.
Stroud, J. W., Rogers.
Sucas, C. C., Herber.
Tarkio, J. M., Harana.
Trainer, John, Mena.
Vincenheller, A., Fayetteville.
Vincenheller, Col. W. G., Fayetteville.
Vincenheller, G. A., Fayetteville.
Walker, Prof. Ernest, Fayetteville.
Ward, A. F., Clarksville.
Warren, T. J., 902 Creath Ave., Jonesboro.
Webb, J. T., Rudy.
Wells, J. W., Bentonville.
White, W. E., Bentonville.
Whittenburg, W. T., Mena.
Wilson, C .E., Staunton.
Wilson, Henry M., Siloam Springs.
Wilson, J. B., Nunley.
Wilson, L. C., Wickes.
Wolf, E. F., Avoca.
Wolf, T. J., De Queen.
Wooford, J. G., Rudy.
Woods, Bedford, Bentonville.
Woolsey, George, Bentonville.
Yates, C. W., Staunton.
York, Edgar, Mena.
Young, C. A., Greenwood.
Young, W. O., Bentonville.

ARIZONA.

Agricultural Experiment Station, Tucson.
Igo, M. S., Cannille.

CALIFORNIA.

Colby, Wm. E., Secretary Sierra Club, San Francisco.
Crow, M. J., Morganhill.
Evans, Frank B., Selma.
Pacific Fruit Growers World, Chamber of Commerce Bldg., Los Angeles.
Sanderstredt, O. F., 359 Magnolia Ave., Riverside.
Western Empire, Chamber of Commerce Bldg., Los Angeles.

COLORADO.

Brummer, M., 326 18th St., Denver.
Irrigation Fruit Grower & Agriculturist, 225 Fifteenth St., Denver.
Main, J. H., Masonville.
Mattingly, Mrs. J. J., Collbran.
Miller, Ernest G., 510 Ideal Bldg., Denver.
Pierce, J. J., Colorado Springs.
Pratt, L. R., Gleenwood Springs.
Purtee, R. S., Paonia.
Scott, Joe E., Holyoke.
State Board of Horticulture, State Capitol, Denver.

DELAWARE.

Peninsular Hort. Society, Dover.

DISTRICT OF COLUMBIA.

Brackett, Col. G. B., Pomologist, U. S., Dept. Agr., Washington.
Bureau of Soils, U. S., Dept. Agr., Washington.
Chief, Dept. of Commerce and Labor, Washington.
Gould, Prof. H. P., Bureau of Plant Industry, Washington.
Galloway, Dr. B. T., Washington.
Howard, Dr. L. O., Bureau of Entomology, Washington.
Husmann, Geo. C., Bureau of Plant Industry, Washington.
Merrick, Ernest H., 937 B St., Washington.
Office of Experiment Stations, Director of, Washington.

Lake, E. R., Division of Pomology, Washington.
Library, Bureau of Census, Washington.
Library of Congress, Washington.
Library, U. S., Dept. of Agr., Washington.
Smithsonian Institution, Washington.
Stubenrauch, Prof. A. B., Bureau of Plant Industry, Washington.
Van Deman, Prof. H. E., 3630 13th St. N. W., Washington.

FLORIDA.

Corrigan, Dr. Joseph F., St. Leo.
Floyd, B. F., Agr. Exp. Sta., Gainesville.
Harvey, Harry H., Fort Pierce.
Hore, E. L., Stetson
Librarian, Experiment Station, Gainesville.
Schnabel, John, Exp. Station, Gainesville.

GEORGIA.

Cannon, Chas., Route 1, Demorest.
Hard-Scrabble Breeding Farm, Hapeville.
Lewis, Harry J., Hickox.
Wilson, J. S., Sec. National Nut Growers' Association, Poulan.

IDAHO.

Dunford, O. C., Bloomington.
Newton & Fugate, Twin Falls.
Nagel, J. R., Twin Falls.
Wilson, Silas, Nampa.
Woods, H. S., Payette.

ILLINOIS.

Barrel and Box, Ellsworth Bldg., S. Dearborn St., Chicago.
Bass, Max, G. P. A., Great Northern R. R., Chicago.
Baxter, E. J., Nauvoo.
Benedict, B. C., Kampsville.
Blair, Prof. J. C., Urbana.
Brown, F. W., 1040 American Trust Bldg., Chicago.
Brown, P. C., Dixon.
Buckman, Benj., Farmingdale.
Burrill, Dr. T. J., Urbana.
Burton, F. W., Carlinville.
Caspar, W. J., Fairlawn Farm & Orchards, New Burnside.
Carper, D. W., Seymour.
Clowes, Wesley, Plymouth.
Cupp, Henry C., Diamond "C" Fruit Ranch, Fall Creek.
Eisenhart, Dr. W. S., Streator.
Halbert, Lee V., White Hall.
Hampton, J. W., Donnellson.
Harrell, Edward, Kinmundy.
Hayes, James M., Bradford.
Heaton, S. J., Rockport.
Hinckle, U. B., 408 E. Blvd., Marion.
Hitt, Geo. R., Witt.
Hover, Frank, Montzuma.
Howes, Robt. A., 617 S. Hermitage Ave., Chicago.
Huston, H. A., 562 Monadnock Bldg., Chicago.
Jackson, Owen, Rushville.
Kaumanns, Dr. N., 206 Corn Exchange Bank Bldg., Chicago.
Kramel, W. J. ,Moline.
Keuhner, Johnny J., Evansville.
Lambert, J. R., Coalsburg.
Lawson, Mrs. James, Route 4, Roodhouse.
Legler, Henry E., Public Library, Chicago.
Logan, E. S., Trilla.
Mathews, R. A., Route 2, Sporta.
McElroy, Thurman E., Bardolph.
McIntosh, J. O., Springton.
Motzner, Carl F., Moline.
Mueller, Peter, Sr., Valmeyer.
Myers, Robt., Plymouth.
National Poultry Yards, Box 60, Crossville.
Nevinger, Asbury, Route 5, Greenville.
Park & Cemetery, 324 Dearborn St., Chicago.
Perkins, W. H., Route 4, Quincy.
The Prairie Farmer Pub. Co., 120 S. Clinton St., Chicago.
Riehl, E. H., North Albion.
Riggle, R. H., Cameron.
Rushing, R. B., Ozark.
Saxenmeyer, Theo., Red Bud.
Schermerhorn, A. V., Kinmundy.
Schulze Bros., Brussell.
Scott, A. W., Carrellton.
Sommer, Wilbert C., Pekin.
Stanton, J. W., Richview.
Stemmons, W. F., Carlingville.
Tate, Geo. B., Thompsonville.
Throop, A. B., Gilman.
Tristram, F. H., Asst. Gen. Pass. Agt., 311 Marquette Bldg., Chicago.
Whitford, E. M., Farina.
Williamson, C. H., Quincy.
Wylie, O. M., Marissa.

INDIANA.

Clifton, T. M., Marengo.
Crawford, Thomas, Attica.
Daniels, Frank M., Route 1, Rockfield.
Eumy, Alford, Oakland City.
Farmers Guide, Huntington.
Froeler, R. F., Evansville.
Goss, Arthur, Director Experiment Station, Lafayette.
McDaniell, J. L., Cambridge City.
Noble, Wm. K., Fort Wayne.
Purdue University Library, Lafayette.
Reed, Dr. O. E., Purdue University, Lafayette.
Smith, W. O., Dale.
Troxler, R. F., U. S. Public Health & Marine Hospital, Evansville.
Whitaker, O. B., Merom.
Yodis, Guy H., Columbia City.
Zion, J. M., Clark's Hill.

IOWA.

Aldrick, E. L., Keokuk.
Dowell, John B., Bedford.
Frout, Frank, Fairfield.
Fruit & Gardener, Mount Vernon.
Green, Wesley, Des Moines.
Hampton, L. C., 203 W. Linn St., Marshalltown.
Kellar, Miss Daisy, Belle Plains.
Kenyon, D. E., Chapin.
Linton, S. H., Des Moines.
National Horticulturist, Council Bluffs.
Pickett, R. C., 1501 Woodland Ave., Des Moines.
Sinclair, I. M., Cedar Rapids.
Tooker, W. E., Belmont.
Wallace's Farmer, Des Moines.
Wygle, L. P., Ames.

KANSAS.

Adams, H. H., Pleasanton.
Allin, Perry N. Grain Co., Coffeyville.
Barger, Frank S., Merriam.
Barnes, Wm., Topeka.
Barnes, W. E., Vineland.
Black, C. A., 1710 Wall St., Fort Scott.
Bucknerm, Jerry, Elsmore.
Carson, J. S., Muncie.
Coburn, F. D., Topeka .
Chandler, M. E., Route 2, Argentine.
Combs, A. B., Fort Scott.
Campbell, Frof. J. E., Hutchinson.
Dickens, Prof. Albert, Manhattan.
Doney, M. F., Caney.
Dixon, F. W., Holton.
Doenig, D. J., Wellington.

Emmons, D. R., 513 Oakland Ave., Kansas City.
Espenlaub, S. F., Rosedale.
Fry, Geo. A., Iola.
Graham, J. D., Topeka.
Glover, S. C., 720 W. 4th St., Pittsburg.
Griesa, A. H., Lawrence.
Hartzell, Conrad, Sabetha.
Holsinger, Gerald, Rosedale.
Holsinger, Maj. F., Purdue.
Holsinger, Geo. W., Rosedale.
Holsinger, C. V., Rosedale.
Holsinger, W. W., Rosedale.
Huffington, Dane, Latham.
Kern, H. H., Bonner Springs.
Moore, Jas. W., Muncie.
Middlekauff, Wm., Argentine.
Miller, H. L., Galena.
McConnell, J. C., Turner.
Macomb, John, Lawrence.
Pearson, C. W., Edwardsville.
Peck, J. C., Route 2, Argentine.
Perkins, J. S., Argentine.
Porter, Ira E., 223 N. Mill St., Kansas City.
Pratt, B. A., 1427 Merchant St., Emporia.
Probst, W. J., Route 2, Argentine.
Reynolds, Samuel, Lawrence.
Rose, Geo. E., Rosedale.
Selber, Will, Rosedale.
Smith, B. F., 184 Haskell St., Lawrence.
Sorler, Fred, Route 4, Kansas City.
Straub, John, Route 2, Argentine.
Strever, A. E., Russell Springs.
Stubbs, A. W., Kansas City.
Swope, C. A., Route 2, Argentine.
Taylor, Edwin, Edwardsville.
Taylor, Senator, Edwardsville.
Theden, Theo., Bonner Springs.
Thompson, J. A., Edwardsville.
Van Lieu, B. F., Route 1, Kansas City.
Vineing, W. B., Kansas City.
Wellhouse, Walter, State Horticultural Society, Topeka.
Wheeler, H. S., Argenttine.
Welford, Mrs. R., Republic City.
Williams, G. H., Midway.
Willie, L. E., Parsons.
Willis, A., Ottawa.
Wilson, A. M., Muncie.
Wolter, Richard, Arcadia.

KENTUCKY.

Davis, A. M., Lola.
Caudill, J. W., Cescaloosci.
Galloway, B. D., Corydon.
Laws, Thos., Route 2, Dawson Springs.
Leorancy, Sam A., Market Growers' Journal, Louisville.
Talbot, G. W., Philpot.
Turner, Douglas, La Center.

LOUISIANA.

Sinclois, W. S., Longstreet.
Wilson, J. L., Eros.

MAINE.

Ring, Hon. Edgar E., Board of Forest Commissioners, Augusta.
Palmer, Prof. W. R., Orono.

MARYLAND.

Harrison, J. G. & Sons, Berlin.
Richard, T. L., Hagerstown.

MASSACHUSETTS.

Horticulture, 111 Hamilton Place, Boston.
Lane, Wm. C., Librarian, Harvard Library, Cambridge.
Marynard, S. T., Sec. Mass. Fruit Growers' Association, Northboro.
Perkins, M. Sumner, Danvers.
Scott, A. C., 42 Percival St., Dorchester.
Steele, John F., No. 6 Louisburg Sq., Boston.
Rich, Wm. P., Mass. Hort. Soc., Horticultural Hall, Boston.

MICHIGAN.

Brown, A. M., Sec. Mich. Agr. College, Lansing.
Churchill, William, Mendon.
Fruit Belt, Grand Rapids.
Ilgenfritz Sons Co., I. E., Monroe.
Landon, Mrs. Linda E., Librarian Mich. Agr. College, East Lansing.
May, E. E., Edwardsburg.
Scribner, Mrs. Warren, Bancroft.
Shaw, Director Robt. S., East Lansing.
Vanhom, W. F., Mt. Pleasant.

MINNESOTA.

Dorr, Russell R., 644 Andrus Bldg., Minneapolis.
Clements, Prof. Frederich E., Botanical Studies, U. of Minn., Minneapolis.
Latham, A. W., Sec., State Hort. Soc., 207 Kasota Blk., Minneapolis.

MISSISSIPPI.

Graham, C. M., Shurburta.
Halstead, E. W., Ocean Springs.

MONTANA.

Chapman, Mrs. G. N., Springbrook Ranch, Springdale.
Moody, W. I., Hamilton.
McMurry, W. E., Hamilton.
Potter, Dr. P., 51-52 Owsley Block, Butte.
Rollins, R. A., Rollins.

NEBRASKA.

Brown, Tom B., 809 S. 16th St., Omaha.
Dunklin, J. W., Ravenna.
Howard, Prof. R. F., Dept. Hort., Lincoln.
Marshall, C. G., State Horticultural Society, Lincoln.
Noble, Miss Edna C., Librarian College of Agriculture, Lincoln.
Parrotte, M. L., 518 N. Y. Life Bldg., Omaha.
Sommer, C. A., Lincoln,
Thomas, Mrs. Kate, Indianola.

NEW MEXICO.

Babcock, Miss Rena, Deming.
Ellis, Elmer, Mountainais.
Garcia, Prof. Fabian, Agr. College, New Mexico.
Wies, Miss Fannit O., Knowles.

NEW HAMPSHIRE.

Buchelder, N. J., Sec. State Board of Agriculture, Concord.

NEW JERSEY.

Woodruff, C. T., Elizabeth.

NEW YORK.

American Fruits, Rochester.
Barclay, James E., Mt. Pleasant Farm Library, Grahamville.
Collingwood, H. W., Rural New Yorker, New York City.

Cornell Countryman, Ithaca.
Country Life in America, 133 E. 16th St., New York City.
Florists Exchange, No. 2 Duane St., New York City.
Forest, Fish & Game Commission, Albany.
Froat, N. E. D., Keesville.
Fullerton, Director H. B., Long Island Agronomist, Medford, Long Island.
Green's Fruit Grower, Rochester.
Hanley, R. S., National League Commission Merchants, Buffalo.
Harpole, Ed., Dansville.
Leggett, E. H., 301 Pearl St., New York City.
Morgan, Director O. S., N. Y. State School of Agr., Alfred.
National Nurseryman, Rochester.
New York Public Library, 476 Fifth Ave., New York City.
Phillips, R. G., Sec. International Apple Growers' Assn., 612 Mercantile Bldg., Rochester.
Rolfs, F. M., 112 Marshall St., Ithaca.
Rowarth, J. S., 215 Montgomery Ave., Bloomfield.
Rural New Yorker, 409 Pearl St., New York City.
The Sitterly Market Co., Wellsville.
Von Herff, Dr. B., 93 Nassau St., New York City.
Vick's Magazine, Danville.
Vreeland, C. D., 129 Front St., New York City.
Wilding, Geo. H., Rochester.
Williams, Miss H. R., Dansville.

NORTH CAROLINA.

Conn, D. G., Sec. Dept. of Agriculture, Raleigh.

NORTH DAKOTA.

Crawford, Lewis F., Sentinel Butte.

OHIO.

Burkhan, W. T., Cincinnati.
Clark, Othello J., Piqua.
Crawford, M., Cuyahoga Falls.
Cox, U. T., Rockwood.
Experiment Station, Wooster.
Foley, L. B., Auburn Hotel, Mt. Auburn, Cincinnati.
Griswold, Wm. R., Cleveland.
Henderson, Norman H., Cadiz.
Hitchcock, J. E., Oberlin.
Lazenby, Prof. W. R., Columbus.
McVitty, James, Perry.
Spearman, John, Jr., Condit.
Sutton, John A., Findlay.
Stacey, H. C., Perry.

OKLAHOMA.

Arthur, Perry, Stroud.
Beck, T. E., Sunnybrook Farm, Jefferson.
Booth, N. O., Stillwater.
Brummett, M. C., Muskogee.
Calvert, Prof. W. S., Guthrie, Okla.
Clift, Joe W., Elmer.
Coolley, J. S., Oklahoma.
Croniger, C. J., Vinita.
Dunnall, B. H., Welch.
Guiles, E. A., 921 West 22nd St., Oklahoma.
Guy, Mrs. S. D., Elmwood.
Hainston, J. T., Salina.
Haning, M. T., Wewoka.
Hensley, J. R., Parum.
Hill, Homer T., Carpenter.
Jackson, S. B., El Reno.
Lawrence, S. E., Salt Creek.
Letteer, C. R., Supt., Schools, Romona.
Menifee, J. N., 13 N. Birch St., Sapulpa.
Mentzger, A. K., 217 S. 7th St., Muskogee.
Morris, Prof. O. M., Stillwater.
Moss, R. E., (Florist) Vinita, Okla.
Peterman, Mrs L. R., 212 N. Lincoln Hobart.
Stannard, W. N., Miama.
Taylor, J. A., Wynnewood.
Vandiver, Mrs. J. M., Box 21, Broken Arrow.
Wood, Eld. T. A., Chelsea.

OREGON.

Better Fruit, Hood River.
Carpenter, Leonard, Box 797, Medford.
Fishback, R. L., Monmouth.
Lewis, Prof. Claude I., Cornvallis.
Mason, A. T., Hood River.
Power, F. W., 689 E. Ankeny St., Portland.
Timberman, Portland.
Young, W. F., Sherwood.

PENNSYLVANIA.

Blessing, David S., Harrisburg.
Card, Prof. F. W., Sylvania.
Holtzman, B. W., Millersburg.
Hunt, Director Thos. F., State College.
Hooper, S. P., Waynesburg.
Ince, J. L., North Girard.
Lopp, A. I., Northeast.
Riggle, A. A., 212 S. Wade Ave., Washington.
Rodewig, Wm. H., 654 W. King St., York City.
Rolfe, McGhee, North Girard.
Smith, Prof. J. Russell, U. of Pa., Philadelphia.
Stewart, Prof. Jno., State College.
Stumpf, W. G., Lovejoy.
Tysom, Edwin C., Flora Dale.
Varrelman, F. A., Dept. of Zoology, State College.
Wertz, D. Maurice, Waynesboro.

RHODE ISLAND.

Clark, Daniel A., Red Oak Nurseries, Fiskville.
Dunn, John J., Sec. State Board of Agriculture, Providence.

SOUTH DAKOTA.

Hansen, Prof. N. E., Brookings.

TENNESSEE.

Anderson, S. B., Bickford Branch, P. O., Memphis.
Cross, J. W., Hickory Point.
Foster, Madison, Memphis.
Graham, James F., Memphis.
Hall, J. W., Franklin Head.
Johnson, B. P., Rogersville.
Lawhorn, L., Memphis.
Lloyd, Ella, Bradford.
Marris, Eugene, Yuma.
Perry, Fred H., Winesap.
Phifer, J. M., Route 1, Erie.
Tully, Co. Anderson, Memphis.

TEXAS.

Bailey, R. E., Rusk.
Christensen, C. F., Bells.
Holder, H. A., Bowie.
Kone, D. R., Secretary of Agriculture, Austin.
Larkin, T. W., Secretary Texas Farmers Congress, Denison.
Marks, Hilf J., Addicks.
Moore, Wm. L., Box 71, Pilot Point.
Parks, J. W., Route 3, New Boston.
Post & Co., H., Fort Worth.

UTAH.

Widtsoe, Pres. John A., Logan.
Wilcox, Wm. H., Layton.

VIRGINIA.

Balhow, E. H., News Ferry.
Cole, P. T., Asst. Hort. Truck Expt. Sta., Norfolk.
Johnson, Director T. C., Truck Expt. Sta., Norfolk.
Librarian, Agricultural Library, Blacksburg.
McWaugh, W., Lynchburg.
Porter, Jesse J., Louisa.

WASHINGTON.

Atkinson, T. H., Entiat.
Brown, L. M., Sec. State Hort. Assn., Walla Walla.
Carnive, Melvin, White Salmon.
Clark, T. W., North Yakima.
Cosgrove, Robt. H., 218 Hutton Block, Spokane.
Jessup, Sam, Wenatachee.
Lanham, W. B., Clarkston.
Northwest Horticulturalist, Box 104 Tacoma.
Richardson, A. T., North Yakima.
Seattle Public Library, Seattle.
Shippen, Jos., 627 New York Block, Seattle.

WEST VIRGINIA.

Dacy, Prof. A. L., Dept. Hort., Morgantown.
Davidson, C. M., Huntington.
Dotson, E. R., Pennsboro.
Ellifritt, Clifton, Greenwood.
Experiment Station Library, Morgantown.
Frame, Nat T., Sec. Appalachian F. G. Association, Old National Bank Bldg., Martinsburg.
Moore, S. W., Elwell.
Moore, W. N., Five Mile.
Whitham, L. B., Triadilphis

WISCONSIN.

Waters, Thos. B., 607 Jackson St., Oshkosh.
Willis, L. A., 403 15th Ave., Milwaukee.

WYOMING.

Agricultural Expt. Station, Laramie.
Drake, C. H., Cambria.
Maley, M. F., Thermopolis.
Nelson, Prof. Aven, Secy. Board of Hort., Laramie.
Ralston, Will, Lander.

AUSTRALIA.

Warren, J. R., Camberwell, Victoria.
Warren, I. R., "Marathon", 23 Seymour Grove, Camberwell, Victoria.

BRITISH COLUMBIA.

Fouguer, Iver, Hagensboro.
Killough, J. A., Riverside Farm, Pense, Saskatchewan.

CANADA.

Central Experiment Farms, Ottawa.
Fernow, Prof. B. E., Univ. of Toronto, Toronto.
Forestry Branch, Dept. of the Interior, Ottawa.
Ruddick, Commissioner J. A., Dairy & Cold Storage, Ottawa.
Canadian Entomologist, Biol. Dept., Toronto.

CEYLON.

Director Royal Botanical Gardens, Peradeniya.

CUBA.

Henricksen, H. C., Sec. Cuban Nat. Horti. Society, Empedrado 30, Box 1007, Havana.

ENGLAND.

Wilks, Rev. W., Sec. Royal Horticultural Society, London.

HOLLAND.

Van Schaik, A. H. Ingenhoes, Establishment "Labelliflos," Voorschoten.

NEW ZEALAND.

Asplund, Ivar C., Conley Park, Rahotu, Taranaki.

HAWAII.

Board of Agriculture & Forestry, Box 331, Honolulu.

INDIA.

Superintendent, Gov. Gardens in Mysore, Bungalore City.

GERMANY.

General Secretary State Gardens, Berlin.

NOVA SCOTIA.

Shaw, Percy I., Hort. Dept. Agr. Col., Thuro.
Parker, S. C., Berwick

INDEX.

Page

Address of welcome, Strawberry Congress, Neosho 31
Address of welcome, Horticultural Institute, St. Joseph..... 72
Agricultural course at State Normal. 263
Agriculture, nature study as applied to 261
Alternanthera 212
All-the-year-around management of the apple orchard..... 67
Annual meeting at Columbia..... 119
Aphids, fruit tree..... 232
Area producing apples in 1910..... 11
Apple crop, the, of 1910..... 76
Apple crop, marketing the..... 81
Apple diseases—
Bitter rot 148
Blotch 113
Scab 53
Apple growing, what we are finding out about it..... 12
Apple growing fifty years ago and today 77
Apple orchard, the commercial..... 61
Apple orchard, planting an..... 76
Apple requirements 11, 12
Apple seeds, collection..... 178
Apple seedlings, growing and storing. 179
Apple tree, body wash for.....104, 105
Apple trees, hints on pruning..... 173
Apple trees, systems of pruning..... 173
Apples—
Area producing in 1910..... 11
Dwarf 190
Fall varieties 62
Late blooming 12
Methods of propagating..... 177
Profitable for Northern Missouri.. 286
Summer varieties 63
Winter varieties 63
Apple, varieties of—
Bailey sweet..... 104
Baldwin 80
Bellflower 93
Ben Davis....64, 80, 104, 113, 161, 174, 190, 283
Benoni 118
Delicious 81, 93, 104
Duchess 117
Early Harvest 63, 117

Apples—Continued. Page
Fameuse 64
Gano 104
Geniton 152
Grimes Golden 64, 80, 81, 107
Huntsman 104
Ingram.....64, 69, 118, 161
Jonathan..63, 80, 93, 104, 106, 159, 161, 174
Keswick Codlin 118
King David 93
Lady Sweet 104
Liveland Raspberry 118
Lowell 63
Maiden Blush 63, 104
Mammoth Black Twig..... 64
Pennsylvania Red Streak.....118, 284
Rainbow 104
Red Astrachan 63, 118
Red June 63, 118
Sherwood 118
Spitzenberg 93
Stayman Winesap 80
Summer Queen 104
Wealthy.....63, 80, 104, 117, 118
Willow Twig 104
Winesap.....64, 113, 152, 174
Wolf River 118
Yellow Transparent 117, 118
York 64, 80
Apricots 190
Arbor Vitae 214
Are the Springs Colder Now?..... 119
Areas affected by cold wave..... 9
Asparagus fern 98
Asparagus and rhubarb culture..... 217
Asparagus rust 142, 222
Asparagus, varieties of..... 217
Association, berry, trials of a manager of 32
Associations, fruit growers..... 70
Associations organized 14
Arsenate of lead.....11, 87, 152, 154
Auditing committee, report of..... 30
Average daily minimum temperatures for May and June..122, 123, 124, 125, 126
Bacteria 139, 146, 261
Beal, Dr. E. L., Republic, Mo..... 53
Bees and horticulture..... 270
Beet root rot..... 141
Beetle, cucumber 228

Page

Begonias 212
Bell, Mr. 163
Benoni apple, description of. 118
Bermuda grass 216
Berry association, trials of a manager of 31
Berry novelties 245
Bigham, Mayor F. J., Neosho, Mo. . . 31
Bill, inspection 17
Bitter rot of apples. 148
Blanching celery 233, 237
Blackberries 102, 103
Black cap raspberries. 241
Black rot of grapes. 144
Black rot of cabbage. 146
Blight, celery 150
Blight of crucifers. 149
Blizzard, damage to fruit by. 9
Bloom, early 9
Bloomfield, A. W. 107, 108
Blotch, apple 113
Blue grass for the orchard. 74
Bordeaux mixture. . . 54, 55, 107, 108, 111, 112, 152, 153, 236
Bryophyllum 212
Budding—177, 189, 190, 191, 198, 202, 206, 208
Bryophyllum 212
Bulbs, classes of. 215
Budding peaches, process of. 200
Budding plums 206
Budded plums 110
Buds, fruit, how distinguished from wood buds 200
Bulletins, demand for. 13
Bulletins, list of. 15

Cabbage, black rot of. 146
Cabbage club root. 140
Caladium 216
Canker, larch 147
Canker worm 231
Carnation 212
Carnation rust 143
Carrington, W. T., Springfield, Mo. . . 268
Cause of high prices of berries during season of 1910. 44
Celery blight 150
Celery growing 232
Celery rust 236
Celery, varieties of. 232, 234
Census, orchard 14
Chandler, Prof. W. H. 14, 288
Changes in earth's climate. 129
Chapman, John, "Johnnie Apple Seed" 283
Character of winter of 1910. 9
Crysanthemums 212
Cherry curculio 87
Cherry growing in Missouri. 85
Cherry, propagation of. 191
Cherry seedlings 193
Cherry spraying 87
Cherry trees, planting and management of 87
Cherries, classes of. 85, 89

Page

Cherries, varieties of—
Black Tartarian 89
Early Richmond 85, 89
English Morello 85, 88, 89
Montmorency 85, 88, 89
Red Wragg 89
Cider vinegar 84
Cigar plant 212
Cleft grafting 185
Climate, changes in. 129
Clover as a fertilizer. 74
Clover in the orchard. 63
Codling moth 111, 231
Coleus 212
Cold spell 9
Collection of apple seeds. 178
College and agriculture, the. 264
Columbia annual meeting. 12, 119
Commercial apple orchard, the. 61
Committee, auditing, report of. 30
Commitee on awards, Columbia meeting 170
Committee on awards, report of, Springfield meeting 287
Committees, in memoriam. 167, 168
Common sense applied to fruit growing 112
Congress, strawberry, Neosho. . . . 13, 31, 71, 73
Contents, table of. 7, 8
Control of brown rot. 11
Co-operation 155
Co-operation among fruit growers. . . 228

Co-operation—
Benefits of 288, 295
Growth and success of. 289
In marketing 281
In the Northwest 92
Recommendations for Missouri. . . . 318
Co-operative associations—
Benefits of 295
Constitutions and by-laws of. 322
Characteristics of 309
How organized 322
List of 290
Corms 216
Cost of spraying apple trees. 108
Cost of spraying strawberries. 54
Cost of smudging strawberries. 49
Coutant, L., Monett, Mo. 239
Cox, Mrs. S. N., St. Joseph. . . 81, 100, 105
Crocus 216
Crop, fruit, of 1910. 11
Cross-pollination 102, 110
Cross-pollination, planting for. 80
Cucumber beetle 228
Culls 81, 97, 158, 159
Cucurbits, growing 226
Culture, asparagus and rhubarb. 217
Culture, celery 234
Cultivation vs. sod for the orchard. . . 74
Cultivation of the strawberry. . . . 137, 349
Cultivating the orchard. 75, 76, 114
Cultivating the cherry orchard. 86, 88

	Page
Currant cuttings	194
Curculio	87, 111, 152, 153, 198
Cutting asparagus	221
Cuttings—	
Grape	196
Hardwood	194, 214
Plum	207
Root	191
Single eye	198
Stem	213
Darby, M. E., Springfield, Mo	270
Darche, J. H., Parkville, Mo	61, 71, 84, 108, 132, 138, 162, 288
Delegates	15
Deutzia	214
Development of plant diseases	138
Dewberry, the	216
Dibber,	184, 236
Discussions on—	
Are the springs colder now?	131
Cause of high prices of strawberries	45
Does it pay to spray	107
Experience in smudging strawberries	50
How to secure a big yield of strawberries	46
Influence of environmental conditions upon development of plant diseases	152
Inspection of strawberries	59
Latest methods for spraying apple trees	111
Learning the fruit growing business	105
Marketing the apple crop	84
Orchard heating	162
Overproduction of strawberries	38
Planting and management of cherry trees	88
Selecting the trees for planting the apple orchard	81
Sod vs. cultivation for the orchard	75
Spraying strawberries for rust	55
The 1910 apple crop	78
Diseases—	
Asparagus rust	142
Bitter rot	148, 152
Black rot, cabbage	146
Black rot, grape	144
Blight of crucifers	149
Brown rot	139, 145, 154
Carnation rust	143
Celery blight	150
Cherry, of	87
Club root of cabbage	140
Grain rusts	143
Late blight, potato	146
Larch canker	147
Mildews	139
Peach leaf curl	148
Powdery mildew	149
Root rot, beets	141
Root rot, tobacco	140
Rusts	53, 139, 159
Scab	53, 152

	Page
Displays, fruit	13
Districts, special fruit	11
Districts, strawberry	11, 12
Dixon, F. W., Holton, Kan	112
Does it pay to spray	107
Dorrence, G. E., Neosho, Mo	46
Doucin stock, where obtained	190
Dust sprays	232
Dust spray, formula for	112
Dust vs. liquid sprays	111, 112
Dutcher, Prof. C. H., Warrensburg, Mo.	79, 81, 132
Dwarf apple, the	190
Dwarf pear, the	206
Effects of freak season on fruit trees	231
Elberta peaches	113
Elliot, I. Y.	75
Environment and plant diseases	138
Expense of spraying apples	63
Experience in smudging strawberries	47
Farm home strawberry bed, the	278
Favor, E. H., St. Joseph, Mo	92
Ferguson, C. G., St. Joseph, Mo	79, 84
Ferns	98
Fertilizer, clover as a	74
Fertilizer for cucurbits	228
Fertilizer, asparagus	222
Fertilizer, garden	226
Fertilizing peaches	281
Fifty-third annual meeting of the Missouri State Horticultural Society	119
Financial report	20
Flooding—a remedy for frost	114
Flournoy, W. T., Marionville, Mo	163
Forbes, Dr., Illinois State Entomologist	17
Formulae for dust sprays	112
Frost, date of last killing	128, 129
Frosts, late spring	9, 10, 69, 119
Fruit crop of 1910	11
Fruit damaged by blizzard	9
Fruit displays	13
Fruit districts proven	12
Fruit districts, special	11
Fruit growing business, learning the	100
Fruit growing, common sense applied to	112
Fruit growing, future of, in Missouri	68
Fruit growers' associations	70
Fruit trees, effects of a freak season on	231
Fuchsia	212
Fungus	139, 140, 141, 143, 144, 145, 147, 148, 152
Future of Missouri fruit growing	68
Gano, W. G., Parkville, Mo	280, 287
Garrett, C. O., Adelphi, Ia	153, 164, 165
George, R. F., Pierce City, Mo	55, 59, 60
Geranium	212
Geranium, new variety of	98
Golden Seal	216
Gladiolus	216
Gloxinia	212
Goode, Mrs.	105
Goodman, L. A.	71

Page

Grafting, types of—
Whip or tongue..... 177
Cleft 185, 188, 190
Top 185
Grafting.....177, 190, 205, 208
Grafting wax 189
Grafts, making the..... 180
Grafts, storing 183
Grafts, planting 184
Grain rusts 143
Grape black rot..... 144
Grape cuttings 196
Grape pruning, Kniffen system..... 65
Grape, the, its origin and varieties.. 246
Grape vines, planting..... 66
Grape vines, pruning..... 67
Grapes, growing 64

Grapes, varieties of—
Brighton 247
Campbell's Early 65
Catawba 247
Champion 66
Concord 65, 246, 247
Cynthiana 196
Delaware Red 246, 247
Diamond 66
Diana 247
Green Mountain 246
Lindley 247
Martha 247
Moore's Early.....65, 246, 247
Moore's Diamond 63, 246
Niagara 66, 246, 247
Norton's Virginia Seedling..... 196
Ozark 196
Pocklington 66, 247
Woodruff Red 66, 246
Worden 66, 246, 247
Wyoming Red 66, 247

Graves, J. B.....32, 43, 51, 55, 60
Green, H. C., Hood River, Ore..... 165
Griffin, Mr. ...132, 152, 153, 154, 163, 164
Growing celery 232
Growing cucurbits 226
Growing market grapes..... 64
Growing nuts in the north..... 254
Growing sweet potatoes..... 229
Growing and handling peaches for city retail market..... 280

Haldeman, J. R..... 51
Hall, Dr., Springfield, Mo..... 264
Haseman, Dr. Leonard..... 16
Hardwood cuttings 214
Hartman, S. J..... 96
Hatzfield, Judge George.....40, 53
Heater, homemade 160
Heating orchards 159
Heating with straw, brush, etc..... 160
Heaters, orchard.....113, 136, 132, 152
Heaton, J. C. B., New Burnside, Ill. 153, 165

Hemi-parasites 139
Herbaceous or soft wood cuttings.... 212
Hess, Rev. W. W..... 38

Page

Hickories, shellbark 255
High prices of berries in 1910..... 44
Hints on pruning apple trees..... 172
Hitt, R. M., Koshkonong, Mo...31, 38, 44, 50, 71, 73, 75, 78, 132, 153, 154, 284
Hogs in the orchard.....84, 85, 114
Holmes, Mr. 51
Holsinger, George 64
Homemade heaters 160
Horticultural history, some..... 283
Horticultural institute, St. Joseph... 72
Horticultural institute, Parkville.... 61
Horticulture in rural schools..... 257
House plants, some new..... 97
How to secure a big yield of strawberries 46
How to grow plums..... 108
Howard, Dr. W. L., Columbia, Mo. 50, 51, 55, 68, 71, 100, 131, 132, 138, 177, 253
Howard, L. O., Washington, D. C.... 17
Hoyas .....
Hunt, G. W.....107, 108
Hyacinth 216
Hydrangea 212, 214
In the strawberry field..... 276

In memoriam—
Gano, William Groves..... 168
Butterfield, Maurice 168
Walker, S. R..... 168
Indian turnip 216
Indorsements of proposed inspection bill 20, 71, 164
Influence of environmental conditions upon development of plant diseases 138
Injury to plants, winter..... 9
Injury to fruit crop..... 11
Insect enemies of ornamentals..... 266
Insects, effects of winter on..... 9
Insects, rose 267, 268, 269
Inspection bill 17
Inspection bill indorsed.....20, 91, 164
Inspection of nurseries..... 16
Inspection, necessity for..... 17
Inspection, orchard and nursery...52, 70, 71, 91
Inspection of strawberries..... 58
Inspected nurseries, list of..... 16
Inspector's report 16
Irrigating celery 238
Irvin, W. A., Springfield, Mo....159, 162, 163, 281
Irvine, J. M..... 76

Institutes, horticultural—
Columbia 12, 119
Neosho 13, 31
Parkville 13, 61
St. Joseph 13, 72
"Johnny Apple Seed"..... 283
Johnson grass 216
Killing frosts 10
Killing frosts, date of.....128, 129
Killing temperature, peaches..... 132
Krake, H. G..... 72

Page

Land and industrial congress, St. Louis 13
Late spring frosts 10, 119
Latest methods for spraying apple trees 110
Lawler, Mr. 50
Layerage, propagation by 196, 208
Layerage, mound 190, 195, 196, 208
Lead arsenate 11, 87, 152, 154
Leaf, cuttings 212
Leaf curl, peach 148
Leaf spot fungus 87
Learning the fruit growing business. 100
Letter of transmittal 5
Ledl, John, Pierce City, Mo 58
Lilies 212
Lime sulphur 11, 87, 108, 152, 153
Liquid vs. dry sprays 111, 112
Lyles, Robert 51, 55
Logan, George 38, 55
Lowmiller, Dan 71, 153, 154, 165, 287
McNallie, J. F., Sarcoxie 344
Mahaleb stock 192
Mailing list 289
Manager of berry association, trials of 32
Management of the apple orchard 67
Manville, F. W. 108
Mariana stock 206
Market grapes, growing 64
Marketing, co-operation in 281
Marketing peaches 285
Marketing the apple crop 81
May, J. E., La Plata, Mo 286
Mazzard stock 192
Maxwell, Mr. 81, 88, 111
Method of packing strawberries 57, 58
Method of setting strawberry plants. 136
Mildews, powdery 149, 151
Missouri cherry growing 85
Missouri fruit growing, future of 68
Mound layerage 190, 195, 196, 208
Mulching raspberries 244
Mulberry, the 214
Murray, Joe H. 81, 84, 114
Murtfeldt, Miss Mary E., Kirkwood, Mo. 231, 266
Nature study as applied to agriculture 261
Necessity for inspection 17
Nectarines, origin and description . . . 198
Nelson, Harry 105
Neosho strawberry congress 13, 71
New varieties of house plants . . 98, 99, 100
Novelties, berry 245
Nursery and orchard inspection . . . 52, 70, 71, 91
Nurseries inspected 16
Nutting, Mr. 50
Nut growing in the north 254
Object of tillage 76
Office work 13
Old orchards, top working . . . 12, 185, 186, 187, 188
Onions 212

Page

Orchard and nursery inspection 52, 71
Organization, effects of 44
Organization of associations 14
Organizations, strawberry 12
Ornamentals, insect enemies of 266
Ornamentals, propagation of 211
Orchard, all-the-year-around management 68
Orchard, blue grass in 74
Orchard census 14
Orchard heaters 113, 130
Orchard heating 159
Orchard—
The commercial apple 61
Planting and cultivating 284
Planting the 64
Profitable size 61
Sod vs. cultivation 74
Soils 61
Requirements 61
Overproduction of strawberries 40
Overproduction, how guard against . . 42, 44
Ozark Fruit Growers' Association 158
Packing apples 94
Packing of strawberries, shed 55
Paradise stock 190
Parasites 139, 140, 152
Parkville institute 13, 61
Peaches and peach growing in Northwestern Missouri 90, 96
Fertilizing 281
Growing and handling for the city retail market 280
Killing temperature of 132
Marketing 285
On plum stock 208
Process of budding 200
Shipment of 11
Sprayed vs. non-sprayed 11
Peaches, varieties of—
Alton 102
Carman 102
Champion 102
Elberta 97, 154
Georgia 154
Greensboro 280
Matthew's Beauty 97
Pool's Favorite 97
Pickett's Late 154
Triumph 154
Peach buds for propagation 200
Peach crop of 1910 11
Peach leaf curl 148
Peach rot 10, 108
Peach seedlings 200
Peach growing, favored district 12
Pear, dwarf 206
Pear seedlings 205
Pear, standard 206
Pears, varieties of 206
Pecan, the 247, 254
Pecan growing in Missouri 253
Pecans, range of 250
Pecan trees, where obtained 253

Page

Pecans, varieties of.....249, 253, 254
"Pedigreed" strawberry plants...136, 137
Pelham, J. C..... 50
Petunia 212
Physiological factors in strawberry growing 133
Pieplant or rhubarb..... 222
Plank, E. A.....38, 43, 154, 155
Planting apple grafts..... 184
Planting and cultivating strawberries. 46
Plant diseases—
Asparagus rust 142
Bitter rot 148, 152
Black rot, cabbage..... 146
Black rot, grape..... 144
Blight of crucifers..... 149
Brown rot.....139, 145, 154
Carnation rust 143
Celery blight 150
Cherry, of 87
Club root of cabbage..... 140
Grain rusts 143
Late blight of potato..... 146
Larch canker 147
Mildews 139
Peach leaf curl..... 148
Powdery mildew 149
Root rot, beets..... 141
Root rot, tobacco..... 140
Rusts 53, 139, 159
Scab 53, 152

Plant propagation—
Apple 177, 190
Apricot 190
Asparagus 219
Blackberries 191
Cherries 191
Currants 194, 214
Dewberries 196
Gooseberries 196, 214
Grapes 196, 214
Nectarines 198
Peaches 198
Pears 205
Plums 206, 214
Quinces 208
Raspberries 209, 240, 243
Strawberries 210
Ornamentals 211
Pecans 252
Sweet potatoes 229
Plants, winter injury..... 9
Planting an apple orchard..... 79
Plant conditions and weather conditions 138
Planting and management of cherry trees 87
Planting for cross-pollination..... 80
Planting grape vines..... 66
Planting the orchard..... 64
Planting and cultivating the orchard. 284
Planting vegetables, time for..... 224
Planting sweet potatoes..... 229
Plums, and how to grow them..... 108

Page

Plums on peach stock..... 208
Plum cuttings 207
Plum rot 109
Plum stock, kinds and where grown 206, 207
Plums, varieties of.....108, 109
Pope, H. C., Sarcoxie, Mo.....133, 138
Postage bill 14
Potatoes 102, 103, 104
Potato blight 146
Powdery mildews 149, 151
Premiums awarded 114
Prices, strawberry..... 11
Prizes awarded 114, 170
Profitable apples for North Missouri. 286
Privet 212, 214
Propst, J. M.....50, 51
Propagation of plants..... 177
Pruning apple trees, hints on..... 172
Pruning apple trees, systems..... 173
Pruning cherry trees.....86, 88
Pruning grapes 65, 67
Pruning, time 176
Pruning...65, 67, 69, 75, 77, 86, 88, 93, 104, 114
Purple raspberries 243
Quince, methods of propagation..... 208
Quince stock 206
Range of cultivated pecans..... 250
Raspberries.....102, 103, 209, 216
Raspberry culture 239

Raspberries, kinds—
Black caps 241
Red 241
Purple 243
Yellow 204
Raspberries, varieties of....240, 241, 243, 244
Rau, R. G..... 97
Red raspberries 242, 243
Reed, George M., Columbia, Mo..138, 152, 153
Reed, C. A., Washington, D. C...247, 253
Reeder, George, Columbia, Mo...10, 119, 131, 132
Remarks from delegates and visitors. 165
Report of auditing committee..... 30
Report of committee on awards...169, 287
Report of inspector of nurseries..... 16
Report of secretary for 1910..... 9
Report of secretary, financial..... 20
Report of treasurer..... 29
Response to welcome address, Neosho. 31
Response to welcome address, St. Joseph 73
Results of spraying apples..... 63
Results of smudging..... 48
Requirements of the orchard..... 61
Rhubarb or pieplant..... 222
Rhubarb, varieties of..... 222
Richardson, Mr.....50, 60, 162, 163, 164
Riddell, Mr. 164
Ridging asparagus 222
Roberts, J. R., Springfield, Mo..... 257

Page

Rogers, P. A.....39, 45, 55
Root cuttings 191
Root stocks 216
Root tips 209
Roses 212
Rose insects 267, 268
Rot, peach 10, 108
Rot, plum 109
Runners 196, 210, 216
Rural schools, horticulture in..... 257
Rusts 149
Rust, asparagus 144, 222
Rust, carnation 143
Rust, celery 236
Rust, grain 143
Rust, strawberry 53
Rust, wheat 262
St. Joseph institute.....13, 72
San Jose scale..... 70
Scale, pecan 249
Scald, sun 174
Schnell, Henry, Glasgow, Mo..... 276
Scion.....179, 180, 181, 186, 187, 189, 205
Scion wood 179
Scions, treatment of..... 179
Secretary's report for 1910..... 9
Secretary's financial report..... 20
Seeds, apple, collection of..... 178
Seeds, stratification of...178, 190, 193, 198
Seedlings, apple....179, 180, 183, 190, 193
Seedlings, asparagus 218
Seedlings, pecan 248
Seedlings, pear 205
Seedlings, rhubarb 223
Selecting trees for planting an apple orchard 79
Shaffer raspberry 210
Shed packing of strawberries..... 55
Shellbark hickories 255
Shipment of peaches..... 11
Shumaker, Mr. 164
Single eye cutting..... 198
Slime mould 141
Smudging 160
Smudging strawberries, experience in. 47
Smudging strawberries, cost of..... 49
Sod vs. cultivation for the orchard... 74
Softwood or herbaceous cutting..... 212
Soil adapted to apples..... 11
Soil, orchard 68
Some horticultural history..... 283
Some new house plants..... 97
Some physiological factors in strawberry growing 133
Southwest Missouri strawberry industry 40
Special fruit districts proven.....11, 12
Spirea 214
Spraying....69, 70, 77, 96, 113, 114, 152, 153, 163
Spraying apples, expense and results. 63
Spraying apple trees, latest methods of 110
Spraying apple trees..... 105
Spraying, cumulative effects of..... 68

Page

Spraying cherries 87
Spraying, cost of..... 108
Spraying, does it pay?..... 107
Spraying outfit 54
Spraying peaches 11
Spraying strawberries 53, 54
Sprayed vs. non-sprayed peaches..... 11
Spray, time to.....62, 108, 110
Springfield meeting, the..... 257
Spring frosts, late.....10, 69, 119
Springs, are they colder now?..... 119
Spruce 214
Spurgeon, C. H., Springfield, Mo..... 261
Squires, H. A., St. Joseph, Mo....76, 84, 89, 115
Staib, Mr. 50
Standard pears 206
Stark, W. P., Louisiana, Mo....76, 81, 89
Stem rot, rhubarb 223
Stem cuttings 213
Stewart, Mr. 108
Stock.....180, 181, 190, 191, 198, 206
Stone fruits, brown rot of..... 145
Storing celery 232, 237
Storing grafts 183
Storing sweet potatoes..... 230
Stratification of seeds.....178, 190, 193
Strawberry bed, the farm home..... 278
Strawberry congress, the.....13, 31
Strawberry crop 11
Strawberry, cultivation of..... 137
Strawberry district 11, 12
Strawberry field, in the..... 276
Strawberry growing, some physiological factors in..... 133
Strawberry heating 114
Strawberry industry, the..... 12
Strawberry industry, extension of.... 56
Strawberry organizations 12
Strawberry prices 11
Strawberry runners 210
Strawberries—
Acreage 345
Cost per acre..... 352
Cost of spraying..... 54
Cost of smudging..... 49
Experience in smudging..... 47
Fertilizer 52
How guard against overproduction. 42, 44
How to secure a big yield..... 46
Industry of Southwest Missouri.... 40
Inspection of 58
Kind of soil..... 345
Method of packing.....57, 58
Mulching 350
Overproduction of 40
Picking and packing..... 350
Planting and cultivating..... 46
Pollenization of 347
Preparation of the ground..... 346
Profits per acre..... 352
Renewing the beds..... 351
Results of smudging..... 48
Selecting varieties 346

Page

Setting plants 348
Shed packing of..... 55
Spraying for rust..... 53
Varieties adapted to Northwest Arkansas 43
Varieties recommended..... 353
When to plant..... 347
Yield per acre..... 47
Strawberries, varieties of—
Aroma.....33, 56, 276, 354
Beder Wood 276, 354
Bubach 33, 276, 355
Gandy 53, 276, 357
Haverland 33, 276, 358
Klondike 43, 359
Michel 43, 360
Sample 53, 362
Senator Dunlap 277, 362
Splendid 276, 277, 362
Texas 33, 43, 276, 364
Warfield 33, 53, 277, 365
List of 82 described..... 353
Summer apples 15
Summer apples, advantages in growing 116
Sunscald 174
Sunscald, prevention of..... 175
Sweet alyssum 212
Sweet cherries 85, 89
Sweet potato growing..... 229
Sweet potatoes, varieties of..... 229
System of pruning grapes..... 65
Systems of pruning apple trees..... 173
Table of contents.....7, 8
Temperature, avery daily minimum, May and June..122, 123, 124, 125, 126
Temperature, freezing 10
Temperature fluctuations 127
The 1910 apple crop..... 76
Theime, H., Springfield, Mo..... 246
Thinning fruit 93, 97
Thomas, Mr. 50, 51
Time to spray.....62, 108, 160
Time to prune..... 176
Time of planting vegetables..... 224
Tippin, George T., Nichols, Mo..... 278
Transplanting strawberries 211
Treasurer's report 29
Trials and difficulties of a manager of a berry association..... 32

Page

"Trucker" fertilizer 52
Tobacco root rot..... 140
Top grafting 185
Top working peach trees..... 205
Tulips 216
Turner, D. A., Sr., St. Joseph, Mo..73, 87, 88, 89, 91
Utz, Mr. 91
Van Deman, H. E., Washington, D. C. 254
Vinegar, cider 81
Varieties of asparagus..... 222
Varieties of celery.....232, 234
Varieties of cherries..... 85
Varieties of pecans.....249, 253, 254
Varieties of raspberries.....241, 243, 244
Varieties of strawberries adapted to Northwestern Arkansas 43
Varieties of sweet potatoes..... 229
Vegetables, time for planting..... 224
Ward, Mr. 153
Wandering Jew 212
Wash for apple trees.....104, 105
Wax, grafting 189
Wayman, H. S., Princeton, Mo..... 284
Weather conditions and plant diseases 138
Weather cycles 10, 120
Weather of May.....10, 125
Weather, winter of 1909-10..... 9
Welcome address, St. Joseph..... 72
Welcome address, Neosho..... 31
Western orchard methods applied to Missouri conditions 92
Weston, Mr. 84, 89
What we are finding out about apple growing 12
Whitten, Dr. J. C., Columbia, Mo..76, 217, 222, 226, 229, 232
Wilkerson, Mr. 79, 88
Wilcox, John F..... 74
Wilson, Mr. 152
Willow 214
Winter of 1909-10, character of..... 9
Winter effects on insects..... 9
Winter injury to plants..... 9
Working over old orchards.....12, 185
Woods, Pat, St. Joseph..... 90
Woodson, Dr. C. R..... 110
Yellow raspberry 244
Yield of strawberries per acre..... 47
Young vs. old trees for planting..... 79